



Task Force 05

INCLUSIVE DIGITAL TRANSFORMATION

Building Digital Public Infrastructures (DPI) for Inclusive, Equitable and Quality Education: Educational technology must be based on public values

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Abstract

The policy brief focuses on guidelines for promoting Digital Public Infrastructures (DPI) in the educational sector. Within the G20, there is significant agreement on the scope of DPI, encompassing digital identity, payment methods, and data-sharing. However, we argue that services connected to fundamental human rights, such as the right to education, demand an infrastructural perspective with significant public steering. Moreover, the approach demands the specification of *tangible* aspects rather than solely focusing on software and data frameworks. In addition, the debate at the policy level needs to go beyond discussions on "how to use" technological services such as platforms. Instead, it must consider, in a participatory fashion, "which" and "if" technologies should be used, and importantly, "where" the infrastructure is hosted and maintained. Education managers must engage more critically with infrastructure, which includes understanding and selecting providers based on aspects of their business models beyond perceived gains in educational efficiency. As noted in the UNESCO Global Education Monitoring Report 2023, the vendors often offer positive evidence for adopting new technologies. Digital infrastructure is essential to the functioning of educational organizations, but its role as a structural component of educational governance has yet to be relatively visible to the agenda. Building a digital ecosystem requires services and platforms and robust and compliant physical structures such as data centers, increasingly controlled by a small cohort of private corporations. It is increasingly essential to discuss investment in public infrastructures so that public educational systems can have significant control and sovereignty over systems and data created by and used by students, teachers, and administrators. It may also be a catalyst to improve lifelong learning.

Keywords: essential services, right to education, education managers, digital ecosystem, data

Diagnoses

Educational policies on integrating technology in education in Brazil, from PROINFO in the 90s (Gomes, Santos and Medeiros 2021) to the current Digital Education National Policy¹, emphasize Internet connectivity and instrumental competencies. However, more than those two critical aspects are needed for a functional digital ecosystem to provide public education as a right. The debate at the policy level must go beyond "how to use" the technology but rather consider "which" technology will be used, "who" controls it, and "where" this technology will be hosted (CLADE 2024).

Infrastructure, whether provided by the state or private actors (or a combination of both), is increasingly crucial for educational organizations. It is a key element for a country to ensure data sovereignty for its schools and higher education institutions. However, the issue of who owns, hosts, or controls digital infrastructures has not generally been considered a contentious issue for public education at all levels. This is a significant shift from the traditional state control, with higher education institutions and school systems² increasingly adopting cloud-based educational platforms that are not under the stewardship of the state and are not hosted locally (Amiel 2023a). There has been a complacent attitude towards the privatization of infrastructure, whether through the NasNuvens³ brokerage of private services by RNP or through state actors' argumentation focused solely on cost reduction values (Amiel et al. 2021).

Policymakers need to understand better how infrastructural technologies work, who uses them, how they function, evolve and sustain themselves. Corporations commonly

¹Available at: https://www.planalto.gov.br/ccivil_03/ Ato2023-2026/2023/Lei/L14533.htm

²According to the Education Under Surveillance Observatory, in Brazil, the majority of state public education systems (mostly responsible for the high-school level) and 15 of the 51 municipal education systems (responsible for lower grades) in cities with more than 500 thousand inhabitants make use of private platforms in education see: <https://educacaovigiada.org.br/> and <https://aberta.org.br/edvigiada-cidades>

³Available at: <https://canal.nasnuvens.rnp.br>

offer free services and platforms for education. Beyond the many issues with the costs of ‘free’ (including privacy, limited interoperability, increased user dependency) (Amiel et al. 2023), it is crucial to consider where infrastructure is hosted (usually hosted outside Brazil and Latin American countries) (CGI.br 2023).

Large corporations own autonomous systems⁴ that operate computer networks connected to the Internet to offer people access to content, services, and applications. These computer networks are physically interconnected Internet infrastructures implemented in specific territories. In this sense, control of the infrastructure means power over the Internet itself, both in the economic and technical spheres (Rosa 2023).

This infrastructure supports the exchange of Internet data packets, allowing the unrestricted use of network applications and services. Many packages carry information (personal and sensitive data, strategic data, confidential messages, etc.) from individuals and institutions that circulate through uncontrolled interconnection processes. Internet providers are contracted to a connectivity architecture concentrated in the United States of America; therefore, data circulation and storage are also concentrated. In this sense, despite the principles of a distributed Internet, the physical network is not; it is at the mercy of commercial agreements and subordinated to private and increasingly concentrated structures.

It is important to emphasize that companies and States have yet to have a symmetric partnership: there is a frequent state dependence on the infrastructure provided by private businesses (Floridi 2020). As such, some businesses determine the nature and speed of technological change. States have not been able to exercise stewardship, most evident in

⁴Autonomous Systems are the IP networks that, once integrated, make up the Internet. Although there are hundreds of state autonomous systems, the vast majority belong to the private sector. Usually, they compose a very concentrated market. For more information, IETF: <http://www.ietf.org/rfc/rfc1930.txt> and ASRank: https://asrank.caida.org/?page_number=2&page_size=40&sort=rank.

the advancement of services based on Artificial Intelligence (Eaves, Mazzucato and Vasconcellos 2024).

According to the Education under Surveillance Observatory (Cruz et al. 2024), 76% of the 646 Public Higher Education Institutions domains in Latin America host their institutional emails in *big tech* companies' servers (either Google or Microsoft, or both). Furthermore, this data indicates that these institutions have also adopted educational cloud-based services provided by those companies, most often offered "free of charge" (Amiel 2023). Due to dependency on these platforms, exacerbated by the COVID-19 pandemic and emergency remote teaching, many institutions that adopted the service for free were forced to convert to paid plans to retain their original terms of service. The outsourcing of public educational infrastructure is so culturally rooted that universities do not even question these companies' business models (Amiel et al., 2021). In multiple cases, institutions that were 'over quota' according to changes in terms of use by Google and Microsoft demanded that faculty, staff, and students delete their data (Amiel 2023).

The Brazilian Internet Steering Committee (CGI.br, 2023) highlights the need for an infrastructural approach specific to the field of education, considering digital sovereignty and educational community data protection. The report also brings cases of bans on specific educational digital platforms and infrastructures, further indicating the key role played by National Research Networks (NREN) in promoting DPI (and sometimes commercial interests) in education.

Recommendations

It is essential to highlight that a strategy is being designed for foreign data centers by the Brazilian Agency for Industrial Development (ABDI)⁵ to attract investment into the country. However, allowing the infrastructure of foreign companies to be installed in national territory does not guarantee that security and privacy requirements will be met, nor does it address the digital sovereignty needs alluded to above. As a counter-example, Chile did not allow the installation of a Google data center in its territory⁶. It is crucial to invest in a sectoral study (education) using existing analyses (such as ABDI), taking into account issues of digital sovereignty and combating data colonialism (Silveira 2022).

A Technical Note launched by CIEB (Center for Innovation for Brazilian Education)⁷ discusses avenues and opportunities for DPI for Brazilian education, which only addresses software issues, including open resources and software and data sharing to improve public data exchange. While it contributes, it does not emphasize physical infrastructure to provide digital. As such, we recommend:

Mapping

Clearly define DPI as a field of *technology based on public values* (Eaves, Mazzucato e Vasconcellos 2024) instead of promoting public funds and resources to create public spaces that primarily advance commercial interests. It is important to identify and map major DPI in education projects from around the world and create a

⁵Available at: <https://datacenters.abdi.com.br/>

⁶Available at: <https://br.ign.com/tech/120993/news/google-quis-abrir-um-data-center-no-chile-de-us-200-milhoes-mas-foi-bloqueado-pelo-uso-excessivo-de>

⁷Available at: <https://cieb.net.br/wp-content/uploads/2024/03/Nota-Tecnica-CIEB-IPD.pdf>

forum where experiences can be exchanged, expanding regional silos where cooperation potential is evident;

Expand existing studies to conduct in-depth comparisons between the services offered by digital, proprietary, and private technology monopolies and those that can be offered by public DPI, whether solely public or in partnership with private societal actors, with significant stewardship from the State.

Engagement

Engage multilateral organizations and their existing initiatives, such as UNESCO and UNICEF's Gateways⁸ project, which aims to help countries establish and improve public digital learning platforms, as well as the Digital Public Goods Alliance⁹, among others. Engage institutions and enterprises that offer open solutions¹⁰ created for the educational sector;

Foster financing and strengthen collaboration and partnerships in order to develop of shareable data infrastructure within G20 countries, such as the Open Clouds for Research and the Open Cloud Mesh¹¹ from the European Union¹².

Implementation

Encourage local exchanges between different technical sectors that are essential to providing DPI in education, including hosting (infrastructure, both public and private), telecom providers (access), platform and service providers (learning management

⁸Available at: <https://www.unesco.org/en/digital-education/learning-platforms-gateway>

⁹Available at: <https://digitalpublicgoods.net>

¹⁰Available at: <https://www.unesco.org/en/open-solutions>

¹¹Available at: <https://wiki.geant.org/display/OCM/Open+Cloud+Mesh>

¹²Available at: <https://www.ocre-project.eu/>

systems, video-conferencing, file sharing, and the like), and support and customization (educational, training, maintenance);

Promote cooperation among NRENs, which are actively engaged in aspects of DPI implementation and/or support to promote common principles for educational digital infrastructure with public values.

Scenario of outcomes

As Barbosa (2022) highlights, if the debate around digital sovereignty advances from essential areas, such as education, the potential for generating multidimensional positive impacts for sustainable development will be considerable. This is supported by a report, created at the request of the European Commission, that signals that combined digital and environmental education are the basis of what would be “sustainable digital sovereignty” (Herlo, Ullrich, and Vladova 2023). Improvement in education benefits all sectors of the economy.

Promoting digital sovereignty through education is part of strengthening public education as evidenced in the Abidjan Principles¹³. It is also supported by the immense value of educational and scientific data as sources of knowledge and technological advancement, as well as vital statistics for monitoring public policies; and the need to prevent and mitigate risks to children and adolescents, often arising from the business model of big tech educational platforms. Moreover, the development of digital platforms and services, is, in itself, an indicator of scientific and technological know-how, and

¹³Available at: <https://www.abidjanprinciples.org/>

implementing, maintaining and sustaining DPI is essential for economic advancement and sovereignty.

Possible scenarios:

Embracing the outlined recommendations could lead to a variety of scenarios with diverse outcomes:

- Improved discussions on digital sovereignty and inclusive education through strengthened international cooperation

The potential of having a sectoral approach to DPI and digital sovereignty is strategic to enable parallel international cooperation within the G20 and the fulfillment of national interests. If, on the one hand, advocating for the control of critical data and infrastructure may lead to more autonomy and less technology dependency, it can also generate lock-ins or measures that may lead to Internet fragmentation. Therefore, it is key to advocate for open solutions and a basic physical infrastructure to be developed and maintained in every country (or region) to balance power structures within the digital space and foster cooperation. This process can be targeted, as in the case of education.

Implementing governance and oversight structures may enhance international cooperation. A potential material outcome from this common approach to DPI for education may be investing in developing interoperable, modular open frameworks/infrastructures for education that are shareable among G20 members and, eventually, with other countries. Balancing national interests is still the major challenge, moving away from international competition and market concentration.

- Improved quality and increased access to education and removal of technological lock-ins

Developing specific policies focused on the adoption of open solutions, granting funds to public research and teaching institutions, and fostering and fomenting local software and hardware development and support to educational systems;

Building a robust digital policy with a view towards sustainability and mass adoption while regulating the market and reducing the pressure of lobbying and influence of major private actors and foreign States in the development of these strategies;

Organizing a compliance system to ensure that education is delivered with the best interests of children and teachers in mind. At the same time, compliance evaluation consumes public resources and could alternatively be used to foment the development of local technologies aligned with public values by design¹⁴;

Promoting critical digital literacy for all actors in the field of education, to prevent them from being continuously subject to surveillance as soon as they leave the school environment. The latter, however, must consider not only *individual* responsibility (for posting, sharing), but also raising awareness on the business model of services and platforms used in educational environments.

Developing DPI can help make available appropriate education-related data that could be used by governments and the civil society in the best interest of children, such as to develop privacy-preserving solutions, as well as innovative and collaborative solutions to improve teaching learning (Hooper, Livingstone e Pothong 2022).

¹⁴Available at: <https://www.surf.nl/en/about-surf/surf-and-public-values>

- Public consortia for DPI in education

A policy agenda promoting DPI in education will enable serious engagement by educational institutions as active participants in technological development. Acting alone to provide infrastructures is a daunting task. But with support and encouragement from the government through a DPI agenda, both schools and higher education institutions can begin to engage in consortia or cooperative models of technological development. Examples of such models exist and flourish, including SIVON (<https://sivon.nl/>) and SURF (<https://www.surf.nl/>) in the Netherlands, ESUP-Portail (<https://www.esup-portail.org/>) in France, specific activities by RNP in Brazil (<https://conferenciaweb.rnp.br/>), and the Sciebo (<https://www.scielo.br/>) project in Germany. These projects use the power of cooperative membership to strengthen and improve expensive and time-consuming processes of procurement, contracting and compliance, including DPIA (Data Protection Impact Assessment), sharing expertise, facilitating exchange, and promoting technologies with public values.

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