



Digital platforms used for teaching: an analysis of professor practices from four university institutions in the northeast of Brazil

Plataformas digitais utilizadas para o ensino: uma análise das práticas dos professores de quatro instituições universitárias do nordeste do Brasil

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ABSTRACT

Due to Covid-19 pandemic, platformization process for education has intensified all around the globe, which mobilized institutions to adopt emergency remote teaching at different levels of education. Within that context, the present article analyses how male and female professors from two universities and two public institutes in northeast Brazil interacted with those platforms, especially those linked to Big Techs, in their teaching, research, and extension practices. The investigation comprised a quali-quantitative basis, by means of an online questionnaire to collect and produce data, with the participation of 327 male and female professors. The results show the degree of platformization of such institutions, as well as the difficulties found by the participants in order to implement their practices of teaching and learning. The conclusion of the study points to referrals that may be implemented within those spaces in order to produce a more critical and active stance in the institutions, professors, researchers, technicians, and students when facing the collection, foretelling, and modeling of behavior performed by the platforms which have been mediating the education actions.

Keywords: platformization, big techs, university teaching, digital platforms for teaching.

RESUMO

Devido à pandemia de Covid-19, o processo de plataformação da educação se intensificou em todo o mundo, o que mobilizou instituições a adotarem o ensino remoto emergencial em diferentes níveis de ensino. Nesse contexto, o presente



artigo analisa como professores e professoras de duas universidades e dois institutos públicos do nordeste brasileiro interagiram com essas plataformas, especialmente aquelas ligadas às Big Techs, em suas práticas de ensino, pesquisa e extensão. A investigação compreendeu uma base quali-quantitativa, por meio de um questionário online para coleta e produção de dados, com a participação de 327 professores e professoras. Os resultados mostram o grau de plataformização de tais instituições, bem como as dificuldades encontradas pelos participantes para implementar suas práticas de ensino e aprendizagem. A conclusão do estudo aponta para encaminhamentos que podem ser implementados nesses espaços a fim de produzir uma postura mais crítica e atuante nas instituições, professores, pesquisadores, técnicos e alunos frente à cobrança, previsão e modelagem de comportamento realizada por as plataformas que têm mediado as ações educativas.

Palavras-chave: plataformização, big techs, docência universitária, plataformas digitais de ensino.

1 INTRODUCTION

Datafication process has been taking place in contemporary society in distinct segments, including education, through mediation of the so called Digital Platforms for Education (Williamson, Bayne & Shay, 2020).

Such process is directly linked to the presence of Big Techs, also known as GAFAM (Google, Amazon, Facebook/Meta, Apple and Microsoft) or even FAANG (Facebook/Meta, Apple, Amazon, Netflix and Google).

Beyond those corporations, platforms such as Twitter, Spotify, among others, also occupy a remarkable place within these dynamics of platformization in different parts of the map, such as Asia, for example with BATX (Baidu, Alibaba, Tencent and Xiaomi). Together, those companies have become proprietors of the content and data we produce.

Birch e Bronson (2022) prefer using the term Big Tech to the detriment of others that have been used, because, in addition to being more consistent, it avoids divergences in acronyms, once changes of corporations names may occur, such as Facebook/Meta, diverging, for example, from the acronym GAFAM.

Those Big Techs are constituted as sociotechnical agencies which organize themselves taking into consideration economic, cultural, technical



aspects, among others, which influence contemporary social dynamics and shared understandings (Selywn, 2022) around phenomena which affect society.

Big Techs present dimensions related to platforms which generate platformization, scale and scalability, which constitute foundations for these corporations, which, in turn, organize themselves through infrastructure, business model, governance system, practices and affordances (Birch & Bronson, 2022; Van Djick, 2017).

For Birch e Bronson (2022) it is necessary to open the technoeconomic black box represented by those corporations, pondering on technoscience domain, political economics and the dynamics of their narratives, conditions, practices and processes in distinct society segments, among them, education.

With regard to education, we highlight the Dossier "The datafication of teaching in higher education: critical issues and perspectives" (Williamson, Bayne & Shay, 2020) and, in Brazil", the recent study "Education in a scenario of platformization and data economy" by the Working Group of Educational Platforms of the Internet Steering Committee (Núcleo de Informação e Coordenação do Ponto BR, 2022).

Drawing on Pasquale (2015), the term black box refers to the way a system works that presents itself as mysterious, in which we can identify the inputs and outputs of information, but there is no transparency of how one becomes the other (inputs and outputs). According to the author, we have no idea how far this information can travel, how it is used, or what its consequences are.

In a dialog with authors Birch & Bronson (2022), Selywn (2022) outlines the growing presence of Big Techs in school and academic scenarios, especially Google, with its products and services, for example laptops Chromebook, Google Classroom, professors, formation processes, with curriculum propositions which structure themselves mediated by technologies such as artificial intelligence.

Besides Google, Microsoft, Apple and Amazon stand out in the field of education, with services and actions which aim at collecting and modelling behavior delineating an adaptative learning, that is, they personalize learning in



order to interpret and meet student's needs, stemming from the traces left in the environments.

Within that context it is fundamental to analyze how do professors from universities and institutes located in the northeast of Brazil interact with those platforms in their teaching, research and extension practices?

Thus, the present article is structured in four sections and one conclusion. In the first one, denominated Introduction, a brief characterization of Big Techs action is presented, focusing on the educational field.

In the Datafication and teaching platformization section, the digitization and datafication processes are differentiated, and aspects of platformization are presented, in particular the growth of interaction in educational scenarios during the Covid-19 pandemic.

The materials and methods are presented and discussed in the third section, identifying the quali-quantitative perspective as the theoretical-methodological contribution, as well as the empirical space, subjects, stages of research and ethical care.

The results are presented in the fourth section and are organized into categories and will be analyzed in dialogue with the theoretical references that have been produced around the issues of platformization and education.

Finally, in the Conclusions, we point to the need to encourage more critical attitudes on the part of people who interact with these platforms in different scenarios, as well as possible consequences that the platformization process can generate for world education.

1.1 TEACHING DATAFICATION AND PLATFORMIZATION

Before delving into the discussion on datafication and platformization, it is important to differentiate datafication from digitalization.

Authors such as Lemos (2013) and Talin (2021) point out that the differences between digitalization and datafication, however inter-linked, present distinct characteristics.



According to Talin (2021), digitalization is the process of conversion of analogical means into bits and bytes, that is, an information mapping in a binary version of 0 and 1, being that phase before datafication.

For Lemos (2013), it is a systematic process of extracting and tabulating data that are dispersed and apparently irrelevant, but that when interconnected can become useful and valuable information.

Datafication, in itself, is not about converting an analogical object into a digital one. Rather than that, it is a set of methods of collecting, processing and treating data in order to make predictions based on the performance of the systems of algorithmic intelligence.

This process allows converting each action into traceable, quantifiable, and analyzable digital data, producing diagnoses and inferences in the most diverse areas. For this being, it needs a robust algorithmic management, which simultaneously performs the digitalization of things and searches a better data performativity, being capable of identifying and correlating patterns, behaviors and predictions of new actions.

As a means of improving that algorithmic management, it is necessary a patternization of data collection, calculus and storage processes, which are potentialized from platformization originated in the Big Techs, structuring the ecosystem of data collection. (Poell, Nieborg & Van Dijck, 2020).

According to the authors mentioned above, “platformization is defined as the penetration of infrastructure, economic processes and government structures of digital platforms in different economic sectors and spheres of life” (2020, p.1). These authors present three dimensions of platformization, in the first, the development of data infrastructures, which relate to the ways in which digital platforms are transformed into data (datafication); the second refers to the reorganization of economic relations around multilateral markets and the third to the governance that governs user interactions, optimizing engagement and retention.

Within the education scenario, Mazzucato, (2020) points out that roots-platforms (Big Techs), such as GAFAM, consider that the teaching sector is an



important niche to be dominated because of the huge market in which S.A companies grow and that, in turn conduct the management of financial funds linked to teaching institution nets.

For Silva & Couto (2022), the majority of these platforms used for education belongs to corporative propriety, thrusted by algorithmic architectures and business models, which rapidly get millions of users and establish new learning processes and teaching practices.

According to Moraes (2021, p.1), through that platformization, the Big Techs “Keep on collecting sensible data, as they were commodities of the era of digitalization, without the necessity of asking for authorization, neither from students, nor teachers, nor institutions, which “cede” to their platforms and apps” (Sic).

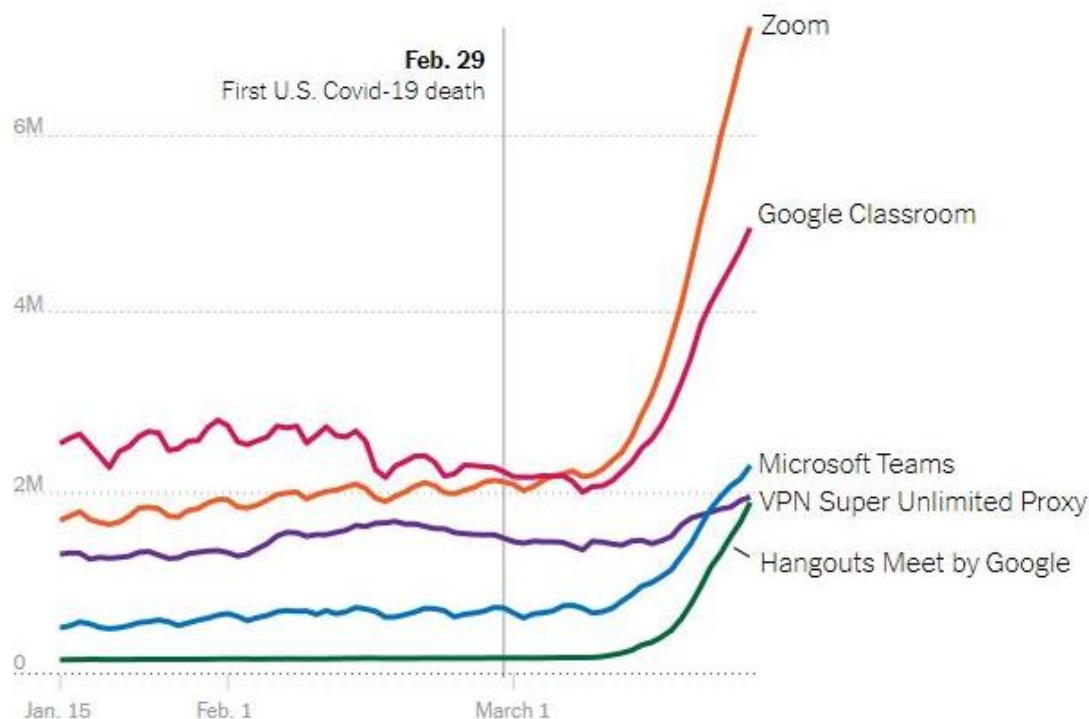
For this same author, in possession of all these generated and correlated data, GAFAM, for example, could use them to sell courses and certifications to the world of work, from a programmed instruction perspective, a mass education, unsophisticated, but well profitable for these companies, among other possibilities.

Linked to this, the debate on homeschooling has been gaining ground in Brazil over the last few years. For Moraes (2021) Big Techs can take advantage of this scenario to influence families in the future to replace classroom educational activities with distance education courses and methodologies.

Due to Covid-19, which forced institutions to enter remote teaching realms, that process of platformization was overly accelerated. According to Kleina (2020) the service offered by Google Classroom doubled in quantity of accesses in the beginning of the pandemic, reaching 100 million people who depend on its resources in a few weeks. The figure below, on the research done by Similarweb (Rodrigues, 2021), portrays the growth in interaction with these platforms for entrepreneurial reunions and remote classes.



Figure 1 - Remote Work and Teaching



Source: Rodrigues (2021)

We can hypothesize that the growth of the Zoom Meetings Platform may be related to the fact that the user uses the first forty free minutes for quick meetings that can be held by different institutions and companies.

Such dependence on the utilization of these platforms forced the users to inattentively or unknowingly use their apps many times regarding to their terms of use and privacy policy, denying the users a period of discussion on aspects such as the General Data Protection Law (GDPL).

It is important to note that this law was only regulated in Brazil in September 2020 in the midst of a pandemic.

In this scenario, it is necessary to widen the discussion on Platformization of education, enabling the actors involved in this process (teachers, students and institutions) a major understanding of that “technological domination” (Moraes, 2021), so that we control the extractivism of data and the collective rights of society over them.



In the following sections, we will present and analyze the data produced in collaboration with 4 teaching and research institutions located in northeast Brazil.

2 MATERIALS AND METHODS

The investigation presented here is part of a larger project whose theoretical contribution is action research which, in Barbier's (2002) perspective, is oriented towards a growing participation of the populations involved, forcing the researcher to become involved. For the author, this implication is perceived by the social structure in which the researchers are inserted, by the interplay of interests, desires of their participants in the investigation process.

We also emphasize that the action research approach is justified because researchers are immersed in the investigative universe, as professors and researchers in the universities that constitute the research body, intensely experiencing the investigated phenomenon.

Thus, the researchers and participants of this research are professors and researchers from the Federal University of Bahia (UFBA), State University of Bahia (UNEB), Instituto Federal Baiano (IF Baiano) and Instituto Federal da Paraíba (IFPB), member institutions of the Research Network "Virtual Communities", located in the northeast region of Brazil, which operate in the capital and countryside of the states of Bahia and Paraíba. With the objective of broadening the understanding of the data in the first stage of the research, we interviewed the technicians linked to the sectors responsible for defining the infrastructure of the respective institutions.

It is important to note that in this article, we present only the results referring to the first part of the research, using a quali-quantitative perspective, to analyze the quantitative data that resulted from the applied questionnaire, but analyzed considering the qualitative issues that tension these results.

In addition to the questionnaire, in the next stages of the investigation, we will carry out semi-structured interviews with teachers and analysis of the platforms indicated by this group, as well as a term of use and recommendation of the companies to which these environments are linked.



The intention of the research was to investigate the states of platformization in education at UFBA, UNEB, IF Baiano and IFPB, referring to joining GAFAM, its infrastructures, business models, governances and practices and affordances, contributing to bringing more transparency to these environments and subsidizing the processes of use decision, pedagogical mediations and the teaching-learning processes. The results presented here refer to the first stage of the research, that is, the mapping of the platformization states, identifying those that are most used in the educational institutions presented above. The aspects indicated above will be further discussed in future publications.

The research was conducted from October to December 2021 and followed the procedures of protecting data from the participants according to the Brazilian General Data Protection Law. It was approved by the Research Ethics Committee through opinion 3.753.216, on December 9th, 2019.

2.1 EMPIRICAL SPACE

The research was officially performed in 4 institutions: UFBA (60% of the participants), IFPB (21%), IF Baiano (10%) and UNEB (8%), totaling 327 answers. Regardless the effort to involve a major number of professors, we found many difficulties in obtaining a significative percentage of answers, except from UFBA, which presented the major number of participations.

The dissemination of the questionnaire occurred systematically and several times in distinct environments through different means, including e-mails directly to the professors and coordinators, during events remotely held and also through WhatsApp contacts. However, that dynamics in involving professors in the research was not enough to ensure a greater engagement. We believe that posture relates to the fact that people have no interest and availability to answering questionnaires, whether or not for academic research. It is important to stress that such posture has been repeating itself in a series of investigations



conducted in academic scenarios, making it difficult, repeatedly, the fulfillment of the objectives of the research¹.

Regarding the choice of Google Forms, we emphasize that we carried out a wide search for other free possibilities for preparing and sharing the questionnaire, but unfortunately, we had no choice but to opt for Google Forms that could be sent to 100 people, free of charge, but with the cost of accessing user data. However, we emphasize that the whole research is aligned with GDPR and the orientations of the Ethics Committee, thus protecting the sensitive data of the participants of the investigation.

We also point out the interview done through e-mail with the sectors responsible for the definition of practices and policies of the interaction with the platforms in the institutions indicated in order to widen the information on these environments and services used, implantation of GDPR and processes of professor formation during the pandemic to orientate the practices mediated by the synchronous and asynchronous tools. We point out that we did not receive any answer from Bahian Federal Institute and IFPB.

3 RESULTS AND ANALYSES

Questionnaire data were analyzed in the period from January to March 2022 and it was organized into three categories. The first one refers to the profile of the professors. The second one presents the results related with the environments which are used by the professors before and after the Covid-19 pandemic, both for the synchronous and asynchronous activities and, lastly, we present the aspects which were indicated by the professors as impediments for the activities performance.

So, it was possible to map the states of platformization in the institutions indicated above.

¹ Such observation is due to the fact that we have significative experience with researches of qualitative base which need to establish a dialog with participants, whether through questionnaires and/or interviews. The difficulty in obtaining the subjects participation has been a huge hindering fact in the investigative proces



Below we present the analysis in dialogue with the data and theoretical dialogues.

3.1 PROFESSOR PROFILE

Data analysis evidenced that the professors who took participation in the research are relatively young, with a predominance of ages around 40 to 44 (with 70 professors), 35 to 39 (with 55 professors) and 45 to 49 (45 professors). Analyzing UFBA's scenario, out of 193 professors who were participants, 12,8% range from 35 to 39, 17,9% from 40 to 44, 18,5% from 45 to 49, 17,4% from 50 to 54.

The overwhelming majority of the gender identity declared by teachers in the four institutions is female (50%), and male (47%), with 2% of the group declaring themselves LGBTQIA+ and only 1% choosing not to inform.

Ethnicity indication reinforces the existent discussion that black people (7%) and indigenous people (1%) are still in smaller numbers inside institutions of higher education, such as professors and researchers, than those who identify themselves as white (49%) and mixed-race (37%). Also we had 3% who did not identify with none of the ethnic groups above.

The configuration of professors profile reinforces two important questions which have been already discussed in other investigations: ethnicity and gender identity (UNESCO, 2019; Monnerat, 2017).

That profile delineation of the institutions involved is also important to understand issues related to professors' identities and the tensions in their practices within the university and in the formation of new researchers and/or professionals, thus allowing the construction of a new perspective which value difference.

3.2 ENVIRONMENTS USED BY THE PROFESSOR PARTICIPANTS OF THE RESEARCH

As for the discussion around the phenomenon of society platformization, professors in their majority (56%) registered that they are following the



discussions that have been made and that grew in the last two years. The growth of that issue may be related to the emergence of remote teaching which we had to experience very intensely in the period from March, 2020 to March, 2022, around the globe due to the Covid-19 pandemic. Although it is important to note that there are still institutions among those surveyed that continue to carry out research and extension activities remotely due to physical infrastructure limitations.

It was possible to observe a contradiction around the statement that teachers have been following the discussions, because, in a second inquiry of the questionnaire, when we included questions related to the typing process (data collection, extraction, and prediction, aiming to model user behavior), only 31% of teachers reported being attentive to the debate.

Professors (71%) reported that they have already used Moodle and Google Classroom, which are Learning Management systems (LMS). The first is an open and free virtual learning environment and the second is linked to one of the companies called GAFAM – Google, Amazon, Facebook/Meta, and Microsoft, before the pandemic. We emphasize that UNEB (since the beginning of 2000) and UFBA already used Moodle as a virtual learning environment in remote courses and as a support for classroom activities.

It was strange for us that the teachers indicated Google Meet, Teams Zoom, and Jitsi, because, before the pandemic, the institutions interviewed only had face-to-face activities. We believe that when answering the questionnaire, teachers may have referred to the period of remote teaching and not to the one in which classes and other activities were in person.

Another finding is due to the fact that the institutions involved in the present research showed anxiety and insecurity when carrying out synchronous and asynchronous activities during the pandemic, requiring the conduction of training processes in order to guide the use of the platforms, taking as an example UFBA, which promoted training processes in pedagogical and technical aspects to



support the practices of teachers and students through the UFBA em Movimento project².

The IFPB (which conducted a formation of 39 hours for the utilization of Google tools, emphasizing the platform Google Classroom, besides conducting a partnership³ with IFBA in order to also qualify their professors)⁴. It was not possible to know which procedures were utilized by IF Baiano because they did not answer the interview conducted through e-mail.

In UNEB's case, formation processes were conducted for the interaction with the Virtual Learning Environment (VLE), the institution's official, Moodle, as well as for the use of Microsoft Teams and of the Sistema Eletrônico de Informações (SEI). These formations were conducted via Microsoft Teams and some of them were broadcasted on the channel TV UNEB on YouTube.

As for the questions of the questionnaire on the environments used, the professors might register more than one option, often combining, one platform dedicated to LMS, with predominance of asynchronous activities and others dedicated to synchronous activities, with the remote meetings for classes and reunions, for example.

With this in mind, the authors Grimaldi & Ball (2021) point to another model called Blender Learning Management System (BLMS), which is a hybrid model, considering the perspectives indicated above, such as Black Board (private), Canvas (private), Moodle (free software), among others.

As for actions during the denominated Remote Teaching, 99% of the professors affirmed having conducted synchronous and asynchronous activities, with the predominance of mediation of the platforms Google Meet (29%), Moodle (21,6%) and Google Classroom (14,2%), Webconference of the Research National Network - RNP (12,7%), Zoom (6,9%), Microsoft Teams (6,3%) and Jitsi

² UFBA em Movimento. Recovered on November 25th, 2020, from <https://ufbaemmovimento.ufba.br/>.

³ Information provided by one of the authors of this article, IFPB professor and researcher.

⁴ Instituto Federal da Bahia. Recovered on July 30th, 2020, from <https://portal.ifba.edu.br/salvador/comunicacao/noticias/2020/campus-salvador-em-parceria-com-o-ifpb-promove-capacitacao-em-ferramentas-do-google-para-ensino-remoto>. Recovered in May 20th 2022.



(3,0%), respectively. Such data point to a model which integrates platforms vinculated to GAFAM (*Google Meet, Classroom and Microsoft Teams*) and open with Moodle, RNP Webconference and Jitsi.

The Webconference is a platform created by the Coordination for the Improvement of Higher Education Personnel (CAPES) to be used free of charge by Brazilian government institutions of higher education. However, it is important to point out that RNP Webconference has its connection and data stored at Amazon Datacenter⁵. So, while free for public institution professors, it is linked to one of the great companies aggregated to GAFAM.

Another important piece of data refers to Zoom, whose free access time limit is 40 minutes for synchronous activities, inducing many professors to pay the subscription to conduct their classes and meetings in that environment, once the duration of classes is 50 minutes. In 2022, Google Meet also adopted the same model as Zoom.

During the pandemic, Bahia State Government institutionalized the use of the platform Microsoft Teams for all its sectors, including the four state universities, among them UNEB, which uses the platform Microsoft Office 365 and the apps Word, Excel, PowerPoint, One Drive, Forms, Stream. The administrative area also interacts with Outlook, Calendar, Power B.I. and Power AUTOMATE, to carry out its technical-administrative activities.

Also referring to Google tools, it is known that UFBA made a deal with that company in order to use unlimited storage space in the cloud and to mirror institutional e-mails, without a financial investment from the university but with permission for wide and unrestricted access to users' data (professors, students and technicians) but the referred company informed last year that they would change its business model, from July 2022 on, starting by charging for the unlimited⁶ use of their tools. The company's proposition is that the public institutions, such as

⁵Piece of data verified at the link - <https://live-aws029.mconf.rnp.br/html5client/join?sessionToken=3umgove5vbnfww9r> . One may observe aws inside the link, which indicates and characterizes the Amazon Datacenter.

⁶ Palmeira, C. (2022). Procon investiga Google por fim do Drive ilimitado em universidades. Recovered on March 29th, 2022, from <https://www.tecmundo.com.br/ciencia/236154-procon-investiga-google-fim-drive-ilimitado-universidades.htm>.



universities, start using 100 Terabytes (TB) for distribution among students, professors and academic community in general, thus hindering access, once many universities, UFBA included, would not be able to afford unlimited access, due to financial crisis experienced by teaching and research public institutions in Brazil⁷.

To meet the demand for recording classes and activities, UFBA institutionalized the Loom⁸ platform, which has a free version, since with the changes imposed by Google, the recording function was blocked in Google Meet for universities that were using it. This tool without financial payment.

The IFPB professors, on the other hand, were oriented towards the optional use of recording software for synchronous classes, since these changes occurred at the end of the semester.

We contacted UFBA's Information Technology Superintendence (ITS), on the context described above and we were informed on April 18th, 2022 that is still unclear and undefined which storage space Google will provide for this institution.

According to the ITS technique "Pattern storage space is 100 TB for each institution, but drawing on to the criteria Google defined, we will be granted additional space. However, we still don't know exactly how much. The idea is to use Google space establishing quotas per user and also aggregate the space supplied by Microsoft (in its Onedrive) of 1TB per user".⁹

UNEB Technology Management has also informed that the university still uses Microsoft Servers for mail and for corporative systems and that they have their own Datacenter. Students do not possess institutional mail by default, but when requested and justified, they may use Microsoft e-mail. Although we tried to obtain information from IF Baiano and IFPB, we had no answer in time so that it could be registered in this article.

⁷ Cortes colocaram em risco mais de 30 universidades federais. Recovered on February 11th, 2022, from <http://apub.org.br/cortes-colocaram-em-risco-mais-de-30-universidades-federais/>

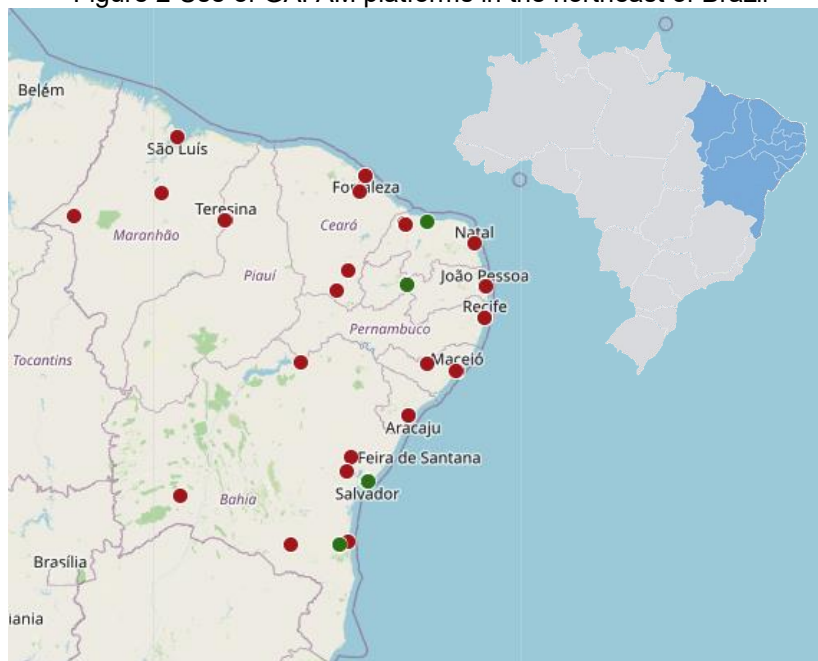
⁸ LOOM. Recovered on May, 10th, 2022, from <https://www.loom.com/>.

⁹ The record above refers to the e-mail exchange between one of the authors of the present article and the STI technician, during the period from April 13th to 18th, 2022 for UFBA; and in UNEB's case, the person contacted was the IT Manager on April 27th and 28th, 2022.

The above scenario makes us wonder why, in spite of the existence of platforms stemming from free softwares, neither they are widely shown, nor used, mainly in teaching public institutions. That fact may be explained by the absence of systematic technical support by the groups which administer the tools, the lack of commercial appeal, among other aspects.

With regard to the data presented above, they explain that the platforms indicated by teachers as teaching and learning spaces before and during the pandemic, show an adherence, including institutional, by the proprietary artifacts and linked to GAFAM. These data are in line with the research that has already been carried out by the project called “Educação Viglada”, which points out that both in Brazil and throughout South America, the use of GAFAM products (in red) has grown in recent years, in detriment of other options (in green) as shown in the map below.

Figure 2 Use of GAFAM platforms in the northeast of Brazil



Source: Educação viglada on April 13th, 2022¹⁰

¹⁰ Observatório Educação Viglada. Recovered on May 20th, 2022, from <https://educacaoviglada.org.br/pt/sobre.html>.



In the research conducted by the group Educação Vigiada, IF Baiano, UNEB and UFBA appear as institutions which do not use GAFAM servers. However, in the specific case of universities, there is a mistake regarding that information. UFBA used Google services and UNEB and State Government Bureaus used Microsoft¹¹.

In face of that growing use of such platforms and, often, of the lack of knowledge of students and professors regarding the process of datafication installed by these companies since the beginning of the years 2000, we question the knowledge of discussions on algorithmic racism, General Data Protection Law – GDPL, control, vigilance and infrastructure for these environments.

But only 23% of professors reported that they are discussing these topics with their students.

UFBA, at the end of 2021, widely released its referrals for tuning with GDPL¹², outlining the importance of being mindful of the legislation including in what it comes to investigations, protecting the sensitive professors, technicians and students data. Such actions must be widened in every institution, providing transparency to the legal document which constitutes part of the external governance system in order to regulate and monitor the actions of the platforms in Brazil. So, constructing a critic perspective on the way those environments function and learning how to protect data is fundamental and it must be part of the discussion in professor practices either being mediated by these artifacts or not.

UNEB created a commission in order to implant GDPL in the institution. Among the action implemented, there is the GDPL (www.lgpd.uneb.br), the nomination of a server as responsible for data, a lecture of consciousness-raising for the management group on what and how important the GDPL is.

¹¹ See details in the following links <http://www.portaldoservidor.ba.gov.br/orientacoes-gerais-para-servidores-sobre-trabalho-remoto>
http://intranet.sefaz.ba.gov.br/scripts/fra_intra2.asp?corpo=http://intranet.sefaz.ba.gov.br/scripts/noticias/noticias.asp?LCOD_NOTICIA=12317

¹² Lei Geral de Proteção de Dados Pessoais (LGPD - UFBA). Recovered on January 2nd, 2022, from <https://lgpd.ufba.br/>.



Presently, that institution is mapping the processes which involve data collection, storage and treatment within the institution. In order to define rules and publicize within the academic and administrative community. IFPB and Bahian Federal Institute still haven't conducted any action linked to GDPR, whether for the law implementation or formation processes for professors, technicians and students.

Platforms have an internal governance system which is responsible for establishing rules, monitoring and terms of use in order to promote the significant experience and fidelization of the user, banning and/or blocking content such as *fake news*, pornography, pedophilia, algorithmic racism, among others. However, it is important to outline that this monitoring is often performed by humans, once the algorithms not always manage to effectively identify the problems evidenced above.

Because algorithms are developed by humans, they present biases that may have underlying prejudicial ideological issues, for example, ones which reflect on the generation of sexist, xenophobic and racist behavior, among others. For example, Val Mendes from (UNESCO, 2021)¹³ questions why the voices of communicational agents such as Alexa, Siri, Cortana, among others, have initially feminine voices. According to the author, it is obvious that the design of these technologies is produced by white men who basically reinforce the stereotype of women as passive caring beings rather than leaders.

Thus, the idea of identity, gender, ethnicities diversity, among others, in the field of technologies development of algorithms may contribute for the decrease of those biases, which may evidence the idea of subservience of women. We must value difference, evidencing the continuous necessity of seeing the world under different perspectives.

In Brazil, issues related to Fake News have been discussed in the sense of moderating in a more effective way the contents which set itself apart from trustworthy information, especially about the participation of congressmen in

¹³ Interview with Podcast Meet at education researcher. Episode AL and education, Aug. 2021. Recovered on April 15th, 2022, from https://open.spotify.com/episode/2PxijsebudS1WwAIH14tvQ?si=AdsiGhV0RIqX7TEne6Uk_Q



social media through the bill 2630 - Fake News – coordinated by congressman Orlando Silva¹⁴.

Bill 2630 aims at ensuring that Brazilian legislation in terms of liberty, responsibility and transparency of the internet is optimized, enforcing rules of control in companies based in Brazil and abroad which offer social media, searching tools and messengers access. As for the foreign companies, the rules will be applied to those that have a number of users registered in the country higher than 10 million¹⁵.

In this discussion, Big Techs have spoken out against the proposed interventions, such as Google¹⁶.

Such issues which put pressure on contemporary society and especially the relation with Big Techs must enter school and academic spaces, widening the discussions in a criticizing way, subsidizing more effective actions referring to data protection and indictments of discriminatory situations.

Professors and students must understand and familiarize themselves with these scenarios, once there will be no return from that, we live now what Lemos (2021) calls “life datafication”. These platforms and including those aimed at education, create recommendation systems to delineate what has been called “adaptative learning”.

3.3 ASPECTS INDICATED BY THE PROFESSORS AS HINDRANCES OF THE ACTIVITIES CONDUCTION

Professors indicated that the immersion in this digital universe, during remote teaching, evidenced difficulties such as:

- a) Activities overload of preparing material for the synchronous and the asynchronous classes (25,4%);

¹⁴ Relator apresenta nova versão do projeto sobre fake News. Recovered on April 18th, 2022, from [https://tiinside.com.br/31/03/2022/relator-apresenta-nova-versao-do-projeto-sobre-fake-news/?utm_source=akna&utm_medium=email&utm_campaign=TI-INSIDE-Online-31-03-2022-19-01&utm_campaign=TI-INSIDE-Online-31-03-2022-19-01](https://tiinside.com.br/31/03/2022/relator-apresenta-nova-versao-do-projeto-sobre-fake-news/?utm_source=akna&utm_medium=email&utm_campaign=TI-INSIDE-Online-31-03-2022-19-01&utm_campaign=TI-INSIDE-Online-31-03-2022-19-01&utm_campaign=TI-INSIDE-Online-31-03-2022-19-01)

¹⁵ Coelho, F. (2022). O PL 2630 pode impactar a internet que você conhece. Recovered on March 11th, 2022, from <https://blog.google/intl/pt-br/novidades/iniciativas/PL2630/> .

¹⁶ Coelho, F. (2022). O PL 2630 pode impactar a internet que você conhece. Recovered on March 11th, 2022, from <https://blog.google/intl/pt-br/novidades/iniciativas/PL2630/> .



- b) Students presented connection problems, hindering the creation of more interactive strategies (23,9%);
- c) Students communicated only via chat, adding to the feeling of speaking alone (23%);
- d) Lack of knowledge on which pedagogical strategies to use in order to mediate the process of knowledge construction on the platform used (13%);
- e) Professors indicated difficulties which involve knowledge and interaction with the platforms and tools (8%), and lastly, technical difficulties, especially internet access (6,6%).

When questioned about the interest in expanding discussions around the process of platforming society, 72% of the teachers reported that they are interested in participating in training processes that deepen the role of Digital Education Platforms in pedagogical practice, analyzing the tensions caused by these environments.

The aspects indicated by the professors such as difficulties, evidence issues which marked professors and students lives during the period of the pandemic, when they had to spend long hours in front of the screen conducting and participating of threaded activities, such as classes, reunions, meetings with master and PHD students and general students, among others.

Regarding the infrastructure for carrying out teaching activities, Pretto, Bonilla & Sena (2020), record that professors had to afford the costs of the physical and technological infrastructure in order to adapt their houses to the needs of their professional practices, from an adequate space for the classes, whether the furniture and equipment used for a better comfort and tranquility for the remote teaching.

As for the specific case of the classes, professors indicated the necessity of preparing differentiated teaching material in order to meet the requirements of the environment and motivate the students to become protagonists, once they spent the class period with microphones and cameras off, whether because of



technical issues, absence of private space in their homes for the online activities an/or lack of motivation for that new class format.

The issues of digital exclusion in Brazil are very substantial, thus restricting the possibilities of access for the students and in some moments for the professors who had to change their internet plans and the 3G net. The TIC research *Domicílios 2020*¹⁷ shows that in the northeast region, only 28% of the homes have internet access and computers, 51% only internet access, while 20% neither have computers nor internet access, which shows the difficulty pertaining infrastructure and connectivity.

Another question raised by the professors was the feeling of being alone at the synchronous moments, what turns out to be very demotivating, once in many classes, students presence and participation was minimal.

As pointed out by Costa (2020), learning is an action which happens mediated by others, thus, immediate feedback is fundamental for learning. Within that context, it is very important to stress students viewpoint on lack of their own participation and interaction in synchronous moments.

According to research conducted by the Startup Descomplica (Corrá, 2021), around 33% of the families informed that their kids don't have exclusive equipment and rooms to study during the pandemic. For that reason, many of them ended not having participated of all synchronous moments, once they needed sharing the computer with another member of the family (49% out of classes D and E) and the inexistence of a proper environment to study makes them uncomfortable with their cameras on.

Also, 80% of the families reported problems of infrastructure (problems with or lack of internet access/equipment and difficulties with the platforms), what makes the students diminish their participation during classes, because the data consumption using audio and video ends up generating a less stable connectivity. UFBA and UNEB made efforts to promote digital access for their students¹⁸.

¹⁷ TIC Domicílios 2020. Recovered on February 14th, 2022, from <https://cetic.br/pt/tics/domicilios/2020/domicilios/A4B/>.

¹⁸ Processos de inclusão digital na UNEB. Recovered in May 20th 2022, from <http://selecao.uneb.br/inclusaodigital/index.php>



Conversely, when it comes to higher education, the research conducted by the organization Chegg.org¹⁹ states that out of 1.030 Brazilian students interviewed, 47% affirmed that they wanted teaching institutions to offer more remote disciplines, provided the monthly payment was reduced, and for 48% of the individuals researched, the diploma should be achieved in less amount of time, provided the costs were more affordable. Such demand from that great parcel of students generates a very attractive consumer market for Big Techs, which, in the future, may provide courses for that student profile.

In order to mitigate such feeling of demotivation and improve the engagement of those ones present in class, some lecturers have used gamification applications as Kahoot, in the preparation of tag cloud in a collective way, among other tools, to mobilize and try to engage them in the suggested discussion.

In this scenario, educators highlighted the importance of formative actions to understand the process of platformization in which the society is inserted, especially education, that has been suffering harassment from Edutecs, which grow aligned with the neoliberal model (Selywn, 2022; Birch & Bronson, 2022).

Decuypere, Grimaldi and Landri (2020) indicate that architecture, intermediate and organizational dimensions, work logics and the conception of education are important aspects to understand the teaching and learning process in the “platformization society”.

The authors emphasize that these four keys are the foundations for building a critical view of Digital Education Platforms - DEP - which have also been called Ed-tech, a fetishized term and that we need to be careful about this enchantment.

The results and analyses discussed above reinforce the need to broaden the discussions and processes of teacher training in different segments of education, with regard to understanding the phenomenon of platformization and

¹⁹ Global Student survey. (2022). Chegg.org. Recovered in May 16th, 2022, from <https://www.chegg.org/global-student-survey-2022>.



the biases existing in the algorithms of these semiotic domains, in order to build perspective and also having a more active and critical practice to resist, what has been called the platformization of education.

Higher education, responsible for the training of new professionals and, mainly, educators, should not be oblivious to the problems discussed in this article.

Our intention is to promote, in the institutions involved in this research, training processes, in order to contribute to opening the black box present in platforms aimed at education and linked to large corporations, especially GAFAM, outlining practices that protect data and learning from teachers, students, technical, enabling the design of dynamics that go beyond the modeling of behaviors.

The results analyzed here to bring a differentiated contribution to the academic community of the global north and also of the global south, including Brazil, where investigations on the problem presented here are still timid and focus on issues related to growth and forms of use. (Cruz and Venturini, 2020; Lima, 2020, Gonsales, Priscila; Amiel, 2020, Pretto et al., 2021; Educação vigiada, 2022; Núcleo de Informação e Coordenação do Ponto BR, 2022) or reviews on the topic (Rodrigues, 2020, among others).

Another point that differs from the studies indicated above is the sensitive listening (Barbier, 2002) of teachers, identifying their practices and difficulties mediated by the DEP, in order to advance the discussion and pedagogical interventions based on what teachers think and do.

Regarding the international scenario, we highlight the significant contributions of Williamson (2015, 2017, 2021), Williamson, Bayne & Shay (2020), Perrota and Williamson (2018), Perrota (2021), Castaneda and Williamson (2021), Martinez-Monés et. al. (2017), Sewlyn, Pangrazio and Cumbo (2022), Bygstad, Ovreid, Ludvigsen & Daehlen, 2022), among others to understand the issues and tensions of platforming on the national scene.

These researchers from European and Australian universities analyze the presence of platforms such as Google, Pearson, ClassDojo, for example,



analyzing issues related to infrastructure, pedagogical, political aspects, among others, subsidizing new investigations to go beyond the criticism of these technological artifacts.

Therefore, our study differs from the others in that it presents a preliminary diagnosis of the platformization states in 4 public institutions in northeastern Brazil. This region is characterized by lower purchasing power and greater difficulty in accessing the internet than the southern and southeastern regions of Brazil.

The data presented here are often unknown and absent in the international literature. Therefore, our contribution brings a look and data from a reality little explored in national and international journals, which needs to be revealed and analyzed in order to strengthen more critical and effective postures and actions in relation to the education platformization process.

4 CONCLUSIONS

Datafication process was potentialized during the pandemic, leading education institutions to join, as fast as possible, this scenario in order to allow students to continue having access to the teaching and learning practices through remote teaching.

Almost immediately, Big Techs have supplied tools to the global market to subsidize this new educational model, initially providing unlimited and, in a certain way, free space in its Drive (also as a means to publicize its services and establish customer retention). This pseudo-gratuity will be withdrawn in Brazil in July 2022, in the case of Google, under the justification that the institutions didn't know how to use the storage optimally²².

Due to the accelerated process of Platformization, users became hostages to the process, blocking wide-ranging discussions about the business models adopted and about management and protection of generated data.

As discussed in this article, Big Techs, through teaching platforms, had a great expansion in the period of the pandemic, consolidating themselves in most public educational institutions in northeastern Brazil. It was also observed the lack



of discussions and pedagogical training on the management of these systems, with regard to their terms of use, as well as in relation to LGPD.

Considering Brazil's continental proportions, its social inequality and increasing public education insecurity which the country has been experiencing, we notice the difficulties encountered by students and professors during this remote teaching process.

In the findings reported in this article, we highlighted the situation in the context mentioned above at four public institutions located in the northeast of Brazil, which operate in higher education and high school (IF Baiano and IFPB operate in both levels), that have demonstrated a prevalence interaction with proprietary platforms, especially Google Classroom and Google Meet, leading us to question why synchronous environment like Jitsi (free software) or Webconference from RNP were not the first choices of professors who took participation in the present research.

Another issue refers to the refusal to be invited to participate in this research (mainly institutions that had smaller participation, as well as the technicians responsible for the definitions of digital infrastructure), which leads us to infer the lack of concern with such serious matters, such as our privacy and data protection. An educational institution must take care of its teachers, students, and other professionals.

This aspect is linked to the lack of knowledge on the part of the participating teachers with issues related to the platformization of contemporary society.

And finally, the overload experienced by teachers during remote teaching to work in unknown technological scenarios, define pedagogical and evaluative strategies, as well as prepare didactic material adhering to these new universes, the technical and access difficulties that teachers and students had, as well as such as the feeling felt by teachers of being alone in synchronous classes were recorded as obstacles during remote teaching.

Faced with this situation and the possible consequences that the educational platform can generate, it is important to create spaces for discussion



about these practices, in order to allow and encourage a more critical attitude from students, professionals, educational institutions, and families, among other interested parties. involved in the definition and interaction of these environments.

This training process can help to guide them to have access to reliable information, protecting their data, in this technological scenario of datafication, which requires a regulation of platformization in a democratic and effective way by the institutions, allowing the understanding of how the main mechanisms in this black box that make up the algorithms that contribute to the datafication of life (Lemos, 2021).

Thus, considering our investigative question "how do teachers from universities and institutions located in the northeast of Brazil interact with those platforms in their teaching, research, and extension practices?", we believe that the results presented here can contribute to the design of practices and public policies that enable a more critical action and agency on the part of teachers when interacting with DEP.

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REFERENCES

Barbier, Rene (2002). A pesquisa-ação. Tradução por Lucie Didio. Brasília: Plano, 2002. Série Pesquisa em Educação, v.3

Bygstad, Bendik; Øvrelid, Egil; Ludvigsen, Sten and Dæhlen, Morten. From dual digitalization to digital learning space: Exploring the digital transformation of higher education. *Computers & Education*. 182 (2022), p. 2-11. To link to this article <https://www.sciencedirect.com/science/article/pii/S0360131522000343>

Birch, Kean & Bronson, Kelly (2022) Big Tech, *Science as Culture*, 31:1, 1-14, DOI: 10.1080/09505431.2022.2036118. To link to this article: <https://doi.org/10.1080/09505431.2022.2036118>

Castañeda, Linda; Williamson, Ben (2021). Assembling New toolboxes of methods and theories for innovative critical research on educational technology. 2021.

Corrá, Daniel (2022). Pesquisa: Maioria dos estudantes teve problemas no acesso à internet durante aulas remotas. CNN. São Paulo, 2022. Retrieved from <https://www.cnnbrasil.com.br/nacional/pesquisa-maioria-dos-estudantes-teve-problemas-no-acesso-a-internet-durante-aulas-remotas/>.

Costa, Natacha (2020). O papel da educação integral em tempos de crise. Centro de Referências em Educação Integral, 2020. Retrieved from <https://educacaointegral.org.br/reportagens/o-papel-daeducacao-integral-em-tempos-de-crise-por-natacha-costa/>.

Cruz, Leonardo Ribeiro da; Venturini, Jamila Rodrigues (2020). Neoliberalismo e crise: o avanço silencioso do capitalismo de vigilância na educação brasileira durante a pandemia da Covid-19. *Revista Brasileira de Informática na Educação*, v. 28, p. 1060–1085, 15 dez. 2020.

Decuyper, Mathias, Grimaldi, Emiliano e Landri, Paolo (2021). Introduction: Critical studies of digital education platforms, *Critical Studies in Education*, 2021, 62:1, 1-16. To link to this article: <https://doi.org/10.1080/17508487.2020.1866050>

EDUCAÇÃO VIGIADA (2022). Observatório Educação Vigiada. Retrieved from <https://educacaovigiada.org.br/pt/mapeamento/brasil/>.

Gonsales, Priscila; Amiel, Tel (2020). Inteligência Artificial, Educação e Infância. Cetic.br -Panorama Setorial da Internet, São Paulo, out. 2020, p. 1–24.

Grimaldi, Emiliano; Ball, Stephen J (2021). The blended learner: digitalisation and regulated freedom-neoliberalism in the classroom. *Journal of Education Policy*, v. 36, n. 3, p. 393-416, 2021. Retrieved from <https://www.tandfonline.com/doi/abs/10.1080/02680939.2019.1704066>.



Kleina, Nilton (2020). Google Classroom dobra em acessos e ajuda país inteiro na pandemia. *TECMUNDO*. 2020. Retrieved from <https://www.tecmundo.com.br/mercado/152016-google-classroom-dobra-acessos-ajuda-pais-inteiro-pandemia.htm>.

Komljenovic, Janja. (2021): The rise of education rentiers: digital platforms, digital data and rents, *Learning, Media and Technology*, DOI: 10.1080/17439884.2021.1891422. Retrieved from <https://doi.org/10.1080/17439884.2021.1891422>

Lemos, André (2013). Big Data: Dataficação, ou extraíndo dados de onde for possível. *Lab 404*. Salvador, 2013. Retrieved from <http://www.lab404.ufba.br/big-data-dataficação-ou-extraíndo-dados-de-onde-for-possível/>.

Lemos, André (2021). Dataficação da vida. *Civitas-Revista de Ciências Sociais*, v. 21, p. 193-202, 2021. Retrieved from <http://dx.doi.org/10.15448/1984-7289.2021.2.39638>.

Mazzucato, M (2020). *O valor de tudo: Produção e apropriação na economia global*. São Paulo. Schwarcz S.A. São Paulo. 2020.

Monnerat, Alessandra (2017). “Teto de vidro” na ciência: apenas 25% na categoria mais alta do CNPq são mulheres. In: *Gênero e Número*. 2017. Retrieved from <http://twixar.me/NFgm>.

Moraes, R (2021). *Plataformização da educação*. 2021. Retrieved from <https://www.brasil247.com/blog/plataformizacao-da-educacao>.

Núcleo de Informação e Coordenação do Ponto BR. *Educação em um cenário de plataformização e de economia dos dados [livro eletrônico] : problemas e conceitos* / [editor] Núcleo de Informação e Coordenação do Ponto BR. -- São Paulo, SP : Comitê Gestor da Internet no Brasil, 2022. Retrieved from https://www.cgi.br/media/docs/publicacoes/1/20220929112852/educacao_em_um_cenario_de_plataformiza%C3%A7ao_e_de_economia_de_dados_problemas_e_conceitos.pdf

Pasquale, Frank (2015). *The black box society: the secret algorithms that control money and information*. Harvard University Press: Cambridge, Massachusetts.

Perrotta, Carlo et al (2021). Automation, APIs and the distributed labour of platform pedagogies in Google Classroom. *Critical Studies in Education*, v. 62, n. 1, p. 97-113, 2021.

Perrotta, Carlo and Williamson, Ben (2018). The social life of Learning Analytics: cluster analysis and the ‘performance’ of algorithmic education, *Learning, Media and Technology*, 2018, 43:1, 3-16, DOI: 10.1080/17439884.2016.1182927. Retrieved from <https://doi.org/10.1080/17439884.2016.1182927>



Poell, Thomas; Nieborg, David; Van Dijck, José (2020). Plataformização. Fronteiras-estudos midiáticos, v. 22, n. 1, p. 2-10, 2020.

Pretto, Nelson De Luca; Bonilla, Maria Helena Silveira; Sena, Ivânia (2020). Educação em tempos de pandemia: reflexões sobre as implicações do isolamento físico imposto pela COVID-19. Salvador: Edição do autor, 2020.

Pretto, Nelson et al (2021). Plataformização da educação em tempos de pandemia. EDUCAÇÃO E TECNOLOGIAS DIGITAIS: desafios e estratégias para a continuidade da aprendizagem em tempos de COVID-19. 1 o ed. São Paulo: Comitê Gestor da Internet no Brasil – CGI.br, p. 1–272.

Rodrigues, Eduardo (2020). Estudos de plataforma: dimensões e problemas do fenômeno no campo da educação. Linhas Críticas, [S. l.], v. 26, p. e28150, 2020. DOI: 10.26512/lc.v26.2020.28150. Retrieved from <https://periodicos.unb.br/index.php/linhascriticas/article/view/28150>.

Rodrigues, Rafael (2021). Pandemia de COVID-19 mudou a forma como usamos a internet. SHOWMETECH. 2021. Retrieved from <https://www.showmetech.com.br/covid-19-mudou-como-usamos-a-internet/>.

Selwyn, Neil. 'Big Tech' (notes on Birch & Bronson 2022). CRITICAL STUDIES OF EDUCATION & TECHNOLOGY. 2022. Retrieved from <https://criticaledtech.com/2022/02/26/big-tech-notes-on-birch-bronson-2022/>.

Selwyn, Neil; Pangrazio, Luci; Cumbo, Bronwyn (2022). Data classes: an investigation of the people that 'do data' in schools. Monash University. Chapter. 2022. Retrieved from <https://doi.org/10.26180/18950555.v2>

Silva, Patricia, Couto, Edvaldo Souza (2022). "Plataformização da Aprendizagem e o Protagonismo Do Ecrã Nas Práticas Pedagógicas." (2022). Scielo Pre-prints. Retrieved from <https://doi.org/10.1590/SciELOPreprints.3697>

Talin, Benjamin (2021). Digitalização vs. Transformação Digital – Diferença e Definição. MoreThanDigital. 2021. Retrieved from <https://morethandigital.info/pt-pt/digitalizacao-vs-transformacao-digital-qual-e-a-diferenca/>.

Van Dijck, José (2017). In data we trust? The implications of datafication for social monitoring. MATRIZES, v. 11, n. 1, p. 39-59, 2017. Retrieved from <https://www.revistas.usp.br/matrizes/article/view/131620>.

UNESCO (2019). Women in science. n. 55, 2019. Retrieved from <http://twixar.me/CFgm>.

Zuboff, Shoshana (2018). Big Other: capitalismo de vigilância e perspectivas para uma civilização de informação. In: Bruno, Fernanda (org.). Tecnopólicas da vigilância: perspectivas da margem. Tradução: Heloísa Cardoso Mourão [et al.]. 1. ed. São Paulo: Boitempo, 2018.



Zuboff, Shoshana (2020). A era do capitalismo de vigilância – a luta por um futuro humano na nova fronteira do poder. Rio de Janeiro: Intrínseca, 2020.

Williamson, B (2015). Coding/learning: Software and digital data in education. Stirling: University of Stirling, 2015.

Williamson, Ben (2017). Big data in education: The digital future of learning, policy and practice. Sage, 2017.

Williamson, Ben. (2021). Making markets through digital platforms: Pearson, edu-business, and the (e) valuation of higher education. *Critical Studies in Education*, v. 62, n. 1, p. 50-66, 2021.

Ben Williamson, Sian Bayne & Suellen Shay (2020) The datafication of teaching in Higher Education: critical issues and perspectives, *Teaching in Higher Education*, 25:4, 351-365, DOI: 10.1080/13562517.2020.1748811
