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The platformization of primary education in The Netherlands

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ABSTRACT

How does platformization work as vehicle for the integration of public online education into a private global digital infrastructure? And how can education technologies ('edtech') be governed at various levels to benefit the public good? In this article, we examine online environments in primary schools in The Netherlands, a traditionally strong public-school system, where platformization has substantially impacted the precarious balance between private and public interests. Mapping the Dutch edtech landscape, we trace how the integration of digital learning platforms and learning management systems into digital learning environments are propelled by two complementary yet competing strategies: *inter*operability and *intra*operability. We argue that the latter challenges the first. Securing education's public interests necessitates a coordinated governance effort at the sectoral, national and European levels.

1. Introduction

For the past five years, online learning environments have increasingly turned into privately owned public spaces governed by the commercial incentives of tech companies (Selwyn 2016; Van Dijck, Poell and de Waal 2018). More recently, the Covid-19 pandemic has served as a catalyst worldwide for the further platformization, datafication, privatization, and commercialization of educational technology or 'edtech'—the combined use of hardware, software, administrative services and online educational resources to facilitate learning (Williamson and Hogan 2020; Selwyn 2020; UNESCO 2020). These accelerations across the globe, but particularly in the USA and Europe, have intensified the need for an analytical investigation of national edtech landscapes as part of a global platformization trend. This article investigates two questions: *How does platformization work as vehicle for the integration of public online education into a private global digital infrastructure? And how can education technologies be governed at various levels to benefit the public good?* As a case in point, we examine the emergence of online learning environments in primary schools in The Netherlands, a traditionally strong public-school system, where platformization is affecting the precarious balance between private and public interests.

In order to understand how platformization works with regards to online education (RQ1), the next section theorizes how digital learning technologies and online resources become integrated into platform ecosystems and digital infrastructures, propelled by an ambition for seamless connectivity based on algorithmic processing of various data flows. But *how* exactly does platformization contribute to the privatization and commercialization of online education and how have public

schools responded so far to this trend? We distinguish between two types of integrating the technical and governance standards of platforms: *interoperability,* aimed at facilitating open connections between a variety of platforms and data flows; and *intraoperability,* aimed at promoting stacks of vertically integrated proprietary platforms.

In the subsequent sections, we explore the edtech landscape in The Netherlands to map how digital learning platforms gradually converge with learning management and support systems into integral digital learning environments, which are in turn combined with infrastructural services to form a complex chain of 'platformized' products. On the one hand, teachers and schools may benefit from the seamless integration of services into a digital ecosystem; on the other hand, they want to keep control over the pedagogical principles of educational environments, the organization of administrative processes, and the deployment of student-generated learning data. The tension between public and private forces divulges how interoperability and intraoperability compete in the shaping of the Dutch online learning landscape.

This brings us to the second research question (RQ2): how can education technologies be restructured to work for the public good? Comparing the strategies of interoperability and intraoperability, we discuss how their concurrent implementation can be complementary and destabilizing at the same time. In the final section, we argue that platformization, to fully benefit the public interests of Dutch education, requires a consequent application of the interoperability principle across *all* levels of the platform ecosystem. This necessitates coordination between local-national initiatives governing platformization at the sectoral level of Dutch primary school education and the development of common infrastructures at the national and European levels.

2. The privatization and platformization of online education

When in 2017, *The New York Times* (Singer 2017) first reported on the 'googlization' of public education in the USA, concerns were mostly leveled at one tech company's penetration of the market for online educational services. Alphabet-Google had not only become the leading provider of classroom software (G Suite for Education) for K-12 levels but also of hardware (Chromebooks) with built-in intermediary applications (e.g., search, Google ID, Android). Worries about 'googlization' were in fact broader concerns about the privatization and platformization of online education.

Privatization predates the onset of digitization, but has revamped previous discussions. Whether educational technology is a driver for better schooling or whether it drives the privatization and commercialization of schools has long been the subject of fierce scholarly debates (Selwyn 2016; Hogan and Thompson 2017; Williamson 2017). Williamson and Hogan (2020) point at the distinction between privatization, which 'happens to schools through the development of quasi-markets through institutional policy and structures e.g., state regulated private sector participation in schooling' and commercialization, which 'happens in schools and involves the creation, marketing and sale of educational goods and services for commercial gain' (8). More generally, privatization and commercialization involve a precarious reshuffling of corporate and public forces; it is a dynamic process that shapes the organization of online educational spaces in local and national contexts (Sellar 2017). At the same time, though, local-national online constellations are woven into globally networked markets, emerging in a geopolitical context of competing ideological and economic forces by means of platformization.

Platformization is much more recent, and can be defined as 'the penetration of infrastructures, economic processes, and governmental frameworks of platforms in different economic sectors and spheres of life' (Poell, Nieborg and Van Dijck 2019, 5–6). Platformization emphasizes how platforms are not just 'objects' but the result of socio-technical and political-economic processes of development and implementation; they are technically integrated into the fabric of societal sectors, transforming their economic dynamics. Tech companies, particularly Google, Apple, Facebook, Amazon, and Microsoft, whose consumer hardware and software platforms are pivotal to amassing data from users and turning them into monetizable assets, have managed to create intricate 'service

assemblages'. These online assemblages can include anything from digital infrastructures, hardware devices, operating software, and cloud services to data analytics, social sharing and sector-specific software, ultimately leading to integrated 'ecosystems' (Blanke and Pybus 2020). Companies with 'rule-setting power' (Castells 2009) in an ecocystem are those who have the potential to combine hardware, software, and databases into integrated services, so they can tie together a wide variety of data flows in the back-end (Van Dijck 2020).

The privatization and platformization of online education becomes visible through its organizing principles: the ways in which various online services are integrated in the physical, social, and organizational environment of schools. The organizing principle of *interoperability* has been defined as 'the way in which services and databases are able to 'talk' to one another and share data across domains and platforms through the programming interface' (Bechmann 2013, 55). Interoperability applies to technological standards as well as to governance frameworks through which different parties agree on the conditions of their mutual connectivity to accomplish a common advantage (Chituc and Rittberger 2019). It is rooted in symmetrical power relations, bridging disparate data flows and aimed at keeping the ecosystem decentralized, open, and diverse. In contrast, *intraoperability* is the strategy to connect platforms that are controlled and exploited by one central actor so this actor can funnel data flows, generated across the ecosystem, into proprietary assets (Sutor 2011; Bechmann 2013). Intraoperability often benefits from integration of services, whose goal is 'to collect and obtain information from a number of systems for some supposed system that asked for this information' (Jakimoski 2016, 33). In theory, intraoperability and integrative services optimize user convenience; in practice, they may result in the incorporation of data flows causing user lock-in and vendor lock-in. Platformization driven by intraoperability potentially accelerates the privatization and commercialization of online public education; more importantly, it pushes datafication, impacting student and teachers' agency (Bradbury and Roberts-Holmes 2018; Yu and Couldry 2020), and may also lead to diminished platform diversity and more surveillance potential in the ecosystem as such (Kumar et al. 2019).

Investigating the socio-economic and political-economic forces of platformization of education, some efforts have focused on national-local edtech landscapes in Australia and the USA (Roberts-Mahoney, Means, and Garrison 2016; Lingard 2019; Regan and Khwaja 2019); others have concentrated on how global Big Tech corporations have started to dominate national markets (Williamson 2017). Few studies have focused on European countries, which have a long tradition of public schools operating autonomously and a public sector that is organized collectively (Hillman, Rensfeldt & Ivarsson 2020). In this article, we will focus on The Netherlands as a case in point to understand public-private tensions in the emerging online educational landscape. Three national Dutch newspapers recently reflected apprehensions about the 'Googlization' of primary education, speculating whether local public schools will soon be dependent on the hardware and educational tools provided by American-based tech companies (Bouma and Van der Klift 2019;Remie and Sedee 2020; Van Baars 2020). The newspaper articles raised a score of concerns related to privatization and platformization: the mounting power of Big Tech versus small tech; the role of global corporations vis-à-vis Dutch edtech providers; the prospect of private companies monitoring student behavior via data flows; and the inequity of corporate investments at the expense of education as a public good. Central stakes in this debate were autonomy, privacy, and surveillance, more specifically a school's sovereignty to organize online pedagogies, a student's privacy with regards to the analyses of learning data, and professionals' autonomy vis-à-vis centralized, opaque systems.

In the following sections, we examine how platformization might draw national-local edtech markets into global platform ecosystems. We want to understand the socio-technical and political-economic strategies that propel the dynamics of privatization and platformization, particularly in the Dutch edtech landscape. Using the concepts of interoperability versus intraoperability, we intend to disclose the struggle between the forces of privatization and forces that invest in education as a public good. Our analysis is based on: (1) a detailed reconstruction of the Dutch edtech landscape and its development using a variety of online materials, including websites, reports and

communications of Dutch publishers and suppliers, national and international edtech companies, and Dutch public service organizations; and (2) a nationwide online-survey amongst ICT-coordinators through which we collected data about types of edtech used in the digital learning environments of schools in primary education.[1]

3. Platform diversity in a layered ecosystem

In The Netherlands, primary education has traditionally been qualified as a public good; tax-funded schools operate independently with regards to professional decision-making about pedagogical and didactic principles, the choice for learning resources, administrative systems, and hardware. Historically, a variety of (mostly national) commercial publishers, sometimes collaborating with schools and teachers' organizations, dominated the market for books. From the turn of the century, publishers expanded their product lines to include digital learning materials, which gradually started to replace or supplement the old-fashioned learning or workbook. Initially these materials were distributed by digital carriers such as CD-rom and DVD, then online via websites of publishers. Importantly, publishers of learning materials formed a market segment distinct from local and national companies supplying educational services—mostly administrative systems and ICT—to schools.

When the digitization of classrooms took off in the last fifteen years, other parties started to compete with publishers and suppliers for schools' tight budgets, disrupting the Dutch market for educational materials. The emergence of a platform-based and data-driven service-ecology transformed the educational landscape into a complex network where schools, legacy publishers and suppliers, new digital service providers (startups), and big tech companies were drawn into a new choreography of relationships (Williamson 2019). Datafication and platformization led to an explosion of different educational apps, platforms, systems and digital services, pushed by the promise of effective personalized learning and efficient classroom management. Yet how are these various services currently being incorporated into the global ecosystem?

At the sectoral level, the Dutch landscape shows a large variety of local and national providers of edtech crowding the landscape. The development of education technologies can be categorized along two lines: *digital learning platforms* (DLP) and *learning management and support systems* (LMS). Digital learning platforms are platforms that in form and content are aimed at instructing or testing knowledge, skills and developing attitudes in schools. DLPs are key sources of data *production*: student-generated data and metadata provide valuable information about learners and learning, which can subsequently be mined to monitor student progress and optimize educational efforts. DLPs can be stand-alone apps or comprehensive packages of learning resources, yet they are increasingly programmed as part of adaptive, personalized learning environments. In the Netherlands, local and national publishers (e.g., Zwijsen, Malmberg, Noordhoff) add digital learning resources to existing educational methods or develop standalone personalized learning platforms (e.g., Bingel). In this latter category, publishers compete with new Dutch digital startups developing personalized learning platforms for classroom use (e.g., Snappet, Gynzy, Muiswerk) and use at home (e.g., Squla).

The second type of sectoral platforms, learning management and support systems (LMS), includes a range of edtech involved in the organization and management of digital learning (Bulger 2016). Originally, these systems served an enabling and supporting role. *Learning administration systems* are the oldest type of LMS; as early as the 1990s, Dutch developers were active in this market to efficiently organize school and student administration. These originally stand-alone administrative systems gradually developed into full-fledged *learning tracking systems*, enabling detailed registration, tracing, and analysis of learning at individual, group and school level over time (e.g., ParnasSys, ESIS, EDUscope). Key incentive for this integration formed an amendment to the 2013 Dutch primary education act, which required schools to use a learning tracking system for

systematically monitoring the development of individual pupils and the school as a whole (MECS 2014).

The flipside of such rich diversity of tools, systems, and applications was of course technical incompatibility or friction between the various forms of DLPs and LMSs. In response, Dutch commercial providers started to offer so-called integrated digital learning environments (DLE), developed by both legacy suppliers (e.g., Rolf Group and Heutink) and digital startups (e.g., Prowise Inc, Cloudwise, Skool). Digital Learning Environments aimed at providing all-in-one systems for learning, testing, monitoring, administration, and communication between teachers, students and parents; in addition, they started to also function as centralized portals for single-sign-on access to DLPs and LMS of national and international providers.

About the same time, *international* providers of LMS services had entered the market, targeting schools with attractive offers. A significant growth could be witnessed in 'packages' offered by big tech companies, combining educational apps for communicating with students, preparing and sharing assignments, and student collaboration (G Suite for Education, Office 365 for education). Unlike national startups and legacy actors, companies like Google, Apple, and Microsoft can offer integral access to operational and computational software as well as to crucial infrastructural services as part of the same ecosystem. Laptops and tablets typically come equipped with basic operating systems and standard software packages. Google and Microsoft's hardware devices and their operating systems are coupled onto cloud-based services (e.g., Google Cloud and Microsoft 365) interconnecting edu-app 'packages' (e.g., Classroom) with, for instance, networking and data storage, device management, real-time monitoring, and user authentication. With an estimated market share of seventy percent (Remie and Sedee 2020), Google has become the largest in Dutch primary education. Their market share grew by thirty percent each year between 2016 and 2019, with 170,000 Chromebooks purchased for primary and secondary education in 2018 alone (Bouma and Van der Klift 2019).

Platfomization in online education in Dutch primary schools is an ongoing process where technical imperatives and pedagogical principles are constantly balanced off, and where arguments like 'seamless integration' and 'user convenience' are weighed against the potential consequences of data extraction and automation for the quality of education (Perrotta et al. 2020). In practice, platformization involves negotiation and competition between various private and public actors, between national DLE-providers and global tech companies. The proliferation and diversity of tools and systems triggered the need for integrated systems, but this urge has two different drivers: a public interest in pushing for interoperability and open resources, and a private interest invested in intraoperability and the incorporation of dataflows. In the next two sections, we will describe each of these respective drivers in more detail.

4. Designing interoperability: networking under public control

As early as 2012, Dutch organizations for primary education grew conscious of how the mounting presence of platforms and data-driven services in classrooms required a coordinated effort to help schools actively manage classroom digitization, rather than merely import digital resources into existing teaching practices or administrative systems. Teachers and managers realized that integrating educational apps, tracking systems and learning management tools into comprehensive digital systems is not simply a technical choice to facilitate user convenience; such choice profoundly impacts pedagogical principles, social practices, and student interaction (Beetham and Sharpe 2020). Between 2013 and 2017, a coalition of Dutch ministries, the primary education council (PEC), and a public network organization for education and ICT (Kennisnet) launched several collaborative efforts to pursue an easy-to-navigate, open and diverse online learning environment that creates the preconditions for personalized education. The collective effort to seamlessly integrate educational platforms in Dutch public schools was organized around three main challenges: (1)

the distribution of, and access to, a diverse palette of DLPs, (2) an open and mutual data exchange between platforms and (3) the protection of student privacy.

With respect to the first challenge: guaranteeing access to a diverse palette of edtech products and services has been one of the biggest challenges the sector has faced in the past decade, and it is still ongoing. While nursing a competitive market for educational services, there has always been a high degree of collective organization in the governance of primary education in The Netherlands. Schools have sought collaboration in the form of organizing collective bargaining processes (PEC), supporting ICT-knowledge dissemination (Kennisnet), joint tendering for ICT-products and services (SIVON), and providing digital infrastructural support (SURF). All collaborations aim at strengthening the mission of education as a public good. Launched in 2013, the Education and ICT Breakthrough Project (Kennisnet 2018) spawned several public-private partnerships to organize the 'chain support' of online education. Stimulating a sectoral dialogue about digitizing public education involving both public and private actors, the project aimed at facilitating a decentralized, open, and modular edtech constellation through standardization and interoperability. Crucial for shaping this operation has been the work of Edu-K. Starting in 2015, this public-private cooperative of educational publishers, suppliers, software developers, and umbrella organizations of schools, took the lead in designing a comprehensive agreement to govern interoperability between all levels and types of educational platforms—the diverse palette described above—to the benefit of public schools (Edu-K 2020). Edu-K also translated the agreement into procurements for technical standards to facilitate the connectivity between platforms. All standards for interoperability are monitored and enforced through a nonprofit platform Edustandaard (Edustandaard 2020), coordinated by SURF and Kennisnet.

The collective bargaining between public schools and private companies led to a single-sign-on system called Basispoort, which is still operational today; it facilitates the distribution of digital learning resources from various Dutch publishers and offered registered schools easy online access to these resources (Basispoort 2020). Based on a prepaid licensing system, Basispoort facilitates effortless log-in and easy switching between materials. It also serves as a public gateway to a variety of (private and publicly offered) DLPs and LMS from Dutch providers, hence securing the condition for an open system in which every provider is allowed to participate once accorded with the agreement. Basispoort is endorsed by all prominent Dutch publishers and suppliers willing to invest in public-private dialogue, as well as by public school collectives and organizations such as Edu-K. Significantly, not a single international provider of edtech—most notable none of the big tech companies—is connected to Basispoort or affiliated to Edu-K; we will return to this in the next section.

The second challenge involved translating the agreement into standards facilitating the exchange of student and learning data and data flows between DLPs and LMS, learning tracking systems in particular. Schools increasingly started to adopt personalized learning environments which require the integration of information derived from both DLPs (e.g., learning resources) and LMS (e.g., learning tracking systems). Due to the large number of providers, each offering their own distinct technical operability, it became increasingly difficult to offer adaptive learning methods that automatically connect to a school's relevant student information systems. Edu-K took the lead in designing an open data standard which enables the automatic exchange of learning data and test scores between DLPs and a school's administration and tracking systems (Edustandaard 2019). Open and mutual data exchange between platforms aim at aligning the automated processes for cognitive learning, result monitoring, and adaptive personalized pedagogies, so students can be monitored individually while teachers can track these processes at every stage. Moreover, interoperability pushed by an open data standard stimulates platform diversity and modular ecosystems, granting schools and teachers more freedom to organize their own learning environment. The Dutch open data standard, for example, facilitates third-party companies to develop apps and platforms for processing, analyzing, and visualizing learning data from different platforms; examples include

Leeruniek and Briter which dashboards dedicated to learning analytics can aggregate, analyze, and visualize dataflows from various DLPs and LMSs (Leeruniek 2020)

The third challenge for public schools was to design interoperability for schools to optimize students' privacy protection while keeping control over student data processing. In 2018, the primary education sector, supported by the government, drew up a privacy covenant (Covenant 2018) in which they agreed on how to handle students' personal data generated and exchanged through digital learning materials and tests in accordance with the General Data Protection Regulation (GDPR). For instance, the covenant led to agreed-upon rules about the use of pseudonyms to guarantee student privacy in aggregated data, and about data minimization—the requirement to reduce the number of data attributes in data flows between platforms. The covenant has subsequently been translated into a technical standard, called ECK-iD: a unique and encrypted identification mechanism for students using digital learning materials (ECK-iD 2020). An ECK-iD warrants the authentication of users logging into Basispoort, facilitating the exchange of learning data and results between various networked digital learning platforms and online management systems, while protecting a student's identity for data mining. ECK-iD allows primary schools to control data flows, because they have jointly defined a minimal set of data attributes recorded in an 'attributes policy' (Edu-K 2019).

In short, designing interoperability under public control involved profound private-public negotiations between Dutch actors willing to push a form of platformization that facilitates connectivity between different (types of) platforms by pushing open standards. The concerted effort aimed at creating an open, modular, and decentralized network which promotes schools' control over data flows and the organization of digital learning. Standards were rendered interoperable both technically and governmentally, allowing for direct access to edu-apps as well as a seamless exchange between platforms through a public sign-on facility. However, as we already observed, several large international tech companies refused to sign public-private agreements. In the next section, we sketch how tech companies start promoting intraoperability as their preferred mode of integrating services into platform ecosystems—a process expedited by Dutch DLE-providers.

5. Intraoperability: networking under private control

While public educational organizations invested in openness, national and international corporate actors started to simultaneously invest in building closed circuits of integrated digital platforms. As we have described in section 3, traditional Dutch suppliers (e.g., Heutink and Rolf) and digital 'native' startups (e.g., Prowise Inc. and Cloudwise) started to offer digital learning environments (DLE), bundling functionalities that were previously distinct. The resulting integrated platforms, carrying names such as Prowise GO, Cool, ZuluConnect and MOO, enabled single-sign-on access to learning resources, connecting schools to parties that had co-signed the Basispoort-agreement. Prowise, a digital native that had started in 2010 as a developer of interactive touch screens, purchased Oefenweb—a publisher of adaptive learning apps—to integrate them in a platform called Prowise GO (Prowise 2020a). Combined with presentation programs such as Presenter, ProWise Inc. began to facilitate teachers and schools by combining diverse DLPs and LMSs into integral digital learning environments in their pursuit of personalized education. Like all Dutch DLEs, Prowise signed the agreement with Edu-K, promising to hold their products to the technical and governance standards for access, open data exchange, and privacy norms, hence underwriting the common interest in interoperability.

However, to accommodate a growing demand for user convenience, Dutch DLE-providers increasingly extend their hub functionalities to also collaborate with big tech companies and app developers that have *not* signed the Basispoort and Edu-K interoperability agreement. The luring attractions of this connection are big tech's software packages for teaching and learning in the cloud (G Suite for education, MS Office-365), and their capability to offer integral access to commercial platforms such as YouTube, Skype, and Teams. But the biggest asset offered through these

liaisons is their ability to integrate DLEs and schools with platform services offered by global tech platforms—that is, hardware devices (iPads, Chromebooks), cloud storage (Microsoft Azure, Google Cloud), mobile device management and real-time monitoring solutions (Microsoft Intune, Lightspeed MDM, Google Chrome), and user authentication (Google sign-in, Microsoft login, Apple ID). Each of the national DLE-providers started to engage in strategic partnerships with either one or multiple of the big tech companies (Google, Microsoft, Apple). In 2017, Heutink ICT and Prowise officially became 'Google Education Premier Partners' (Heutink 2017; Prowise 2017) and in 2020 Prowise became 'Microsoft Gold partner' (Prowise 2020b) while Heutink ICT boasted the label 'Microsoft education training partner' (Heutink 2020). The Rolf Group chose Apple as a strategic partner, earning the label 'Apple Solution Expert' in 2019 (Rolf Group 2019).

Big tech companies appear keen on nurturing these partnerships with national DLE-companies. Google's 'Education Partners' are a select group of edtech organizations recognized by Google for their demonstrable expertise in designing, developing, managing and applying Google Cloud technology, G Suite for education and Chromebooks within schools while training educational professionals in the use of these products (Google 2020a). Premier Partners can count on technical, financial and marketing support; Google supports its partners in developing their own 'line' of integrated learning environments including the services offered by Google. Prowise Go, for example, is fully geared to integrate with G Suite for Education, including Google Classroom—Google's platform for teacher and student communication, assignment management, and collaboration. Classroom supports seamless connectivity and data flows with all kinds of third-party learning and teaching apps. Using Classroom API, third parties can program apps onto Classroom and G Suite for Education. Some researchers have argued that third party apps, by extending their functionalities, might enhance commercial ecosystems with data about students and learning, providing a potentially rich resource for learning analytics (Martínez-Monés et al. 2017; Lindh and Nolin 2016). Besides nurturing these partnerships with national DLE-companies, a big tech company such as Google is also dedicated to directly cultivate relationships with Dutch schools through its Google Reference School program. Individual schools are awarded the 'Reference' status for effectively using Google's educational hardware and software and for providing lessons to teach Google skills by teachers officially trained as 'Google Education Trainer' (Bouma and Van der Klift 2019).

At first sight, Dutch DLE-providers and the educational services of big tech companies appear competitors rather than partners, as they both provide integrated learning environments; however, they turn out to be mutually dependent. DLE-providers like Prowise GO are attractive partners to Google because they, having signed the Basispoort and Edu-K agreements, can offer access to the diverse palette of tools and resources which Google cannot because it did not subscribe. For their part, DLE-providers are dependent on big tech companies for giving schools access to services such as cloud storage, analytics, and real-time monitoring solutions. Hence, Dutch DLEs function as pivotal linchpins between the public mission to promote diversity and interoperability and the corporate pursuit of vertical integration via intraoperability. Some might argue these missions are complementary; instead, we argue the latter may actually undercut the former. Why?

First, it is important to understand *how* companies like Google and Microsoft push intraoperability standards in specific sectors. Big tech companies typically stay outside collective sector covenants about open standards, privacy, and interoperability, instead setting their own standards. Their refusal to sign Basispoort-like agreements on privacy and to subscribe to Edu-K standards of interoperability underscores their vested interests in data monetization. Google's integrated hardware and software services—cloud data storage and analytics, device management, real-time monitoring, user authentication services, general communication platforms, and educational apps—engenders 'seamless connectivity' but may also enhance Google's control of the data flows distributed through their proprietary ecosystem. Obviously, all platform companies have to comply with the GDPR with regards to privacy of individual students' learning data; however, the issue at stake here is not just complying with privacy requirements, but the potential power of companies

over processing aggregated data in the back-end. Aggregated information—even if anonymized—may serve as input for advanced personalized learning systems based on AI-analytics which in turn can help to substantially improve educational software offered to schools—hence reinforcing the company's control over the sector (Yu and Couldry 2020).

Second, intraoperability is managed via authentication systems, i.c. Google Sign-In—a single-sign-on functionality for third-party platforms such as partnering DLE-providers. Using Google Account Linking, DLEs can now connect their own user accounts to the Google account, enabling Google's software to interact with third-party services and apps (Google 2020b). Whilst Google promotes its proprietary sign-in system in terms of 'seamless connectivity' and 'user convenience', it may also invisibly link data flows generated within the public school domain, both aggregated and at personal level, to services outside this domain. Allowing private IDs in schools would be at odds with Edu-k's efforts and the design of the ECK-iD, as the latter is an authentication and identification mechanism controlled by schools, who collectively determine what data is recorded and exchanged. While public discussions about combining data flows typically revolve around privacy and security, the concern raised here is one about data ownership and control. As Lindh and Nolin (2016) argue: 'By making an implicit demarcation between the two concepts (your) 'data' and (collected) 'information' Google can disguise the presence of a business model for online marketing and, at the same time, simulate the practices and ethics of a free public service institution' (644).

Third, national DLE-providers take a crucial intermediary position between two potentially conflicting types of governance: one at the level of a public sector, the other one at the level of global tech corporations. Schools opting for a one-stop-shop solution may be tempted to sign a comprehensive contract for their online learning environment with a Dutch DLE-provider, but in doing so, they may inadvertently yield more data-power to big tech companies. Instead of promoting modularity and diversity, intraoperability works toward fixed networks, placing organizational power with platforms rather than with schools. National DLEs understandably appeal to schools' craving for efficiency and unburdening, but they may also push schools towards a convenience track of seamless connectivity.

6. Platformization as risk challenging education as a public good

In the previous sections, we raised questions about the mutual shaping between corporate strategies of intraoperability vis-à-vis public institutions' strategies of interoperability. Such questions are essentially about power, more precisely, about coordinating and rule-setting power (Castells 2009). We argued that big tech corporations' potential to integrate a variety of platform services has the potential to seriously impact institutional control over the processes of online education. Platforms owned by companies such as Google, Apple and Microsoft prefer their own standards of intraoperability, hence securing the potential exchange of data flows within the walled gardens of one company. As a result, the governance of a public sector and its institutions is increasingly dependent on the standards and conditions set by multinational corporations, challenging the interests and values of online education as a common good as it severely impacts the sovereignty of schools and teachers to organize public education.

The public interest in interoperability is invested in designing an open, modular system of learning resources, support systems, and infrastructures. Yet despite the early efforts of the Dutch public educational sector to favor open standards and interoperability, we have witnessed the growing influence of corporate platforms bundling previously distinct resources (DLPs and LMS) into packaged digital learning environments (DLEs). In classroom practice, this means that a student works on a Google Chromebook and might sign in on a digital learning environment such as Prowise Go using a Google account. In Prowise Go they have single-sign-on access to all learning platforms and digital learning materials assigned to their account, including digital learning resources from various Dutch publishers but also Google's Suite for Education apps, which is seamlessly integrated in

Prowise Go. The teacher might instruct students to practice with language and spelling by using the adaptive learning software Prowise Learn (part of Prowise Go) or s/he can set up a grammar assignment in Google Docs and distribute the assignment to the students through Google Classroom. Learning data is either automatically or manually registered in the tracking and management system of the school depending on the data standard employed by the learning software.

By signing onto Basispoort's principles of interoperability yet simultaneously aligning with the intraoperability standards of big tech companies, integrated Digital Learning Environments like ProWise Go can offer schools an attractive set of services—cloud-based working, device management, user authentication—as part of their business proposition. However, the choice for a specific online learning environment comes equipped with the choice for a particular architecture which is never neutral; each platform's architecture presorts the choice for LMS and DLPs—a choice that is increasingly defined by the technical conditions for seamless connectivity and data monetization, rather than by pedagogical and educational principles. Schools' preference for the convenience of one-stop-shops, albeit understandable and perhaps inadvertently, helps reduce the open landscape of educational technologies.

The concerted efforts of school boards and teachers in The Netherlands to keep online education open, diverse, and independent demonstrates the challenges they face when trying to develop and maintain an open system on their own terms. Basispoort started as an ambitious project to maintain a pluriform palette of modular learning resources and support services (DLPs) to guarantee a school's freedom to choose from, and the power to combine, different platforms and functionalities. Crucial to this professional autonomy is the capability of school boards and teachers to take informed decisions about which app, learning management system, or infrastructural service best suits their specific needs and educational values. However, teachers and schools have limited time, budgets, and expertise, so it is tempting to outsource this decision-making process to a company that offers an 'all-inclusive' package. The attractive 'offers by Prowise, enriched by their partnerships with Google, Microsoft or Apple, as well as the companies' direct offers to individual schools, are hard to resist if faced with a choice between do-it-yourself interoperability and the dual propositions offered by these companies.

Nonetheless, the high degree of collective organization of primary education in The Netherlands should give the sector a strong lead in terms of building open digital learning environments. As we have seen in the previous section, agreements like Basispoort, privacy-covenants, and standardized tools such as ECK-iD, help the sector to jointly exercise public control over digitization by designing interoperability as a *collective* principle. These collective efforts—resulting from dialogues between private and public parties—stimulate responsible innovation while enhancing professional autonomy and expertise. The 'Education and ICT Breakthrough project' (Kennisnet 2018) was and still is an important catalyst for this mission, paving the way for public service organizations such as Kennisnet and the Primary Education Council (PEC) to promote educational platformization as a public good. In recent years, the PEC launched additional programs such as 'Smarter learning with ICT' (PEC 2020); the program includes an 'ethical compass' for teachers and school boards to evaluate the impact of ICT-tools on public and ethical values such as safety, equality, and autonomy of digital learning processes (Kennisnet 2020). Moreover, they regularly publish reports to stimulate and educate professionals in responsible data management and organizing digital learning environments that account for public, pedagogical, and ethical values. Starting in 2020, a new liaison of school boards was established to fortify public schools' collective bargaining position vis-à-vis private tech companies (SIVON 2020a). SIVON took the lead in securing safe and reliable internet access for all Dutch schools in primary and secondary education and also helped schools with Data Protection Impact Assessments (DPIA) of edtech platforms.[2] The two sectoral organizations are also the driving force behind a new national policy agenda, which prioritizes public values in online education (MECS 2019).

And yet, despite these laudable collective initiatives aimed at keeping online primary education sector open and public, these efforts have so far failed to address the potential power of primarily big

tech companies to dominate the edtech landscape. Dutch DLE-providers allow these corporations to benefit from open learning environments, even though they refuse reciprocity. So far, DPIAs do not extend to evaluate the conditions set by big tech companies through technical standardization, even though their choice-architecture is an important factor in shaping the edtech landscape as such. While actively involved in developing a public ECK-iD to login to Basispoort, the conditions for interoperability at the local-national level cannot be extended to the global level of the ecosystem, where large private tech companies deploy intraoperability as their preferred organizational principle.

7. Conclusion: governing edtech to serve the public interest

In this article, we have studied how digital platforms and systems in national edtech landscapes have gradually evolved and how they have shaped the educational, administrative, and organizational choices of primary schools; platformization not only affects their governance, but almost invisibly furthers the processes of privatization and commercialization. Various European scholars have sketched possible scenarios of online futures where a traditionally decentralized public sector of education is gradually transformed into a centralized private system of platforms (Hillman, Rensfeldt, and Ivarsson 2020). Our case study of the Dutch educational technology landscape provides a case in point; public schools increasingly yield control over the interpretation of their public function to platform providers. Effectively, intraoperability challenges and may eventually undermine interoperability as an organizing principle for platformization, which triggers the normative question of how the evolving edtech landscape can be restructured as a system that benefits the common good.

To serve the public interests and values of online education, we propose to critically assess the push by tech companies to fully integrate national edtech markets into global platform ecosystems governed by intraoperability principles. The desired primacy of decentralized, diverse, and open ecosystems that strengthens the sovereignty of public schools requires a form of public governance that promotes interoperability across all levels of the platform-ecosystem. As demonstrated in this article, interoperability served as a leading principle for the public effort to govern the design and implementation of online learning environments at the Dutch sectoral level. However, due to the integration of infrastructural services, national interoperability succumbs to global intraoperability imposed by big tech companies, and facilitated by national suppliers of digital learning environments. To fully serve the interests of online education as a common good, national and supra-national governance levels should be addressed in conjunction.

Firstly, this means that the sectoral efforts at securing interoperability in the Netherlands must be supported at a national level, by the Ministry of Education, Culture and Science (ECS). Indeed, the government sustains funding for public education organizations like the Primary Education Council and Kennisnet; ECS also coordinates the implementation of a digitization agenda for primary education (MECS 2019) which highlights structural attention to public values and the development of safe and reliable digital infrastructures. Evidently, it will be near impossible for a single sector, even at the national level, to impact the systemic power of big tech companies to govern data-driven platform societies. On the one hand, it is the lack of public platform services that makes schools ultimately depend on corporate platform ecosystems and their proprietary data management; on the other hand, there is no national or supra-national legislation that forces companies to prioritize public values when serving public institutions, i.c. primary schools.

Secondly, this means that designing interoperability under public control should aim for a more inclusive approach to governance in which the national process of platformization is not seen apart from a European context in which public sectors across the continent are increasingly becoming dependent on non-European corporate platform ecosystems that impose different ideological and socio-economic values. This article discussed public initiatives towards controlling platformization in education at the sectoral and national level in the Netherlands. European cooperation is

essential to extend interoperability initiatives to the supra-national level. Promising in this case is the European public cloud project GAIA-X, launched in June 2020 by France and Germany as a direct response to the power of cloud giants based in the US (Amazon, Microsoft, Google) and China (Alibaba), and the increased dependence of European public and private organizations on these digital infrastructures (FMEAE 2020). GAIA-X, scheduled to be operational in 2021, is planned to develop into a digital data infrastructure that unites European cloud providers in an overarching ecosystem, giving users access to a broad range of cloud products and services (e.g., analytics, AI, Big Data). Its architecture will be based on common European policy rules, standards and values, such as 'openness and transparency', 'digital sovereignty and self-determination', and 'modularity and interoperability' (FMEAE 2020).

Such European intiatives align with the concerted efforts of Dutch public organizations to keep online education open, diverse, and independent whilst maintaining schools' control over data flows and the organization of digital learning. By the same token, the governance and implementation of edtech in distinct countries cannot be seen apart from the geo-political fight to control the future governance of the internet (Van Dijck 2019). This study of the platformization of primary education in The Netherlands would benefit from similar analyses of edtech landscapes in other European countries in order to design a comprehensive strategy, addressing sectoral, national and supra-national actors and informing educational policy-makers across the continent.

Notes

1. This online-survey focused on *what* Edtech platforms were used in Dutch classrooms, but did not generate information about the number of users or intensity of use; therefore, no quantitative conclusions can be drawn based on the results. For this article, survey results were used to inventory the types of edtech systems being used in schools and to understand how digital learning environments are deployed.
2. A Data Protection Impact Assessment (DPIA) is a complex and extensive evaluation process by which a school investigates how a digital platform exactly works, which personal data it processes and with whom data are exchanged. Privacy and security risks are mapped, processing agreements assessed, and checked whether they align with actual practice. Recently, a Dutch collective of schools started executing DPIA's of dominant learning administration and tracking systems; a DPIA of DLEs will follow soon (SIVON 2020b).

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