

Educators should understand how platforms such as Zoom, Google Meet, ClassDojo, and others influence teaching and learning.

**By Antero Garcia & T. Philip Nichols**

Long before a global pandemic pushed schools toward emergency online instruction, a significant amount of teaching and learning was already, in a sense, “virtual.” Over the last decade, instruction, whether face-to-face or online, has increasingly come to be facilitated by *platforms* — in effect, digital spaces where users engage in social or economic exchanges (Gillespie, 2010).

Today’s most familiar and widely used digital platforms are multipurpose giants such as Amazon, Facebook, and Google, but the term also applies to more niche resources, such as the platforms teachers use to support different facets of their work, from classroom management (Google Classroom, ClassDojo) to communicating with families (SeeSaw, TalkingPoints); monitoring school devices (Securely, GoGuardian); offering supplemental instruction (Khan Academy), and helping students create their own content (Voicethread, Prezi, Padlet).

When we talk with K-12 educators about learning technologies, discussion often veers toward questions about which platforms to use (“What’s a good app for assessing writing?”) or how to use them more effectively (“How do I get students to turn their cameras on during Zoom calls?”). In other words,

we find that teachers think of platforms as discrete tools, each one having a very specific function, which it performs well or poorly. But that’s a mistake. These platforms are not analogous to older classroom tools like pencil sharpeners and overhead projectors, and the challenge isn’t just to find good ones and use them effectively. Rather, they are better described as digital worlds unto themselves (distinct “ecologies,” as we like to call them). Each one is its own environment, a place where teachers, students, administrators, corporate vendors, and other people interact.

When teachers think of such platforms as tools, rather than digital spaces, they tend to lose sight of important questions about the kinds of educational environments they want to provide and the kinds of interactions they want to create among students. For example, should we be worried that so much classroom instruction has come to rely on third-party, commercial platforms? (This trend predates COVID-19, but the pandemic has greatly accelerated it.) Do these platforms allow for the kinds of conversations and activities we want our students to have? And to what extent has the scramble for “tools” to facilitate activities in virtual settings transformed our learning spaces for the longer term?

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We encourage educators to consider such questions carefully, looking closely at the ways in which these platforms work with and/or against our goals and commitments as educators. The answers will inform not just how we use digital technology to teach our familiar subject areas, but also how we engage students in deeper inquiry about what it means to live, learn, and create in a world that has increasingly come to be mediated by that technology.

### Why platform ecologies?

On first glance, the term *platform ecologies* can sound needlessly complicated, but it is helpful for highlighting how today's "tools" differ from those of the past. Twenty years ago, a school that purchased hardware (e.g., a computer) and software (e.g., a word processing program) owned those resources outright and could expect to use them for the duration of their life span. Today, things aren't so straightforward. Schools still buy hardware like laptops and tablets, but these devices function less as stand-alone resources and more as intermediaries, connecting classrooms to a range of externally owned software applications, or *platforms*. The difference is subtle, but significant: When schools invest in such services, they no longer pay to own a product, permanently, but to gain temporary access to a platform.

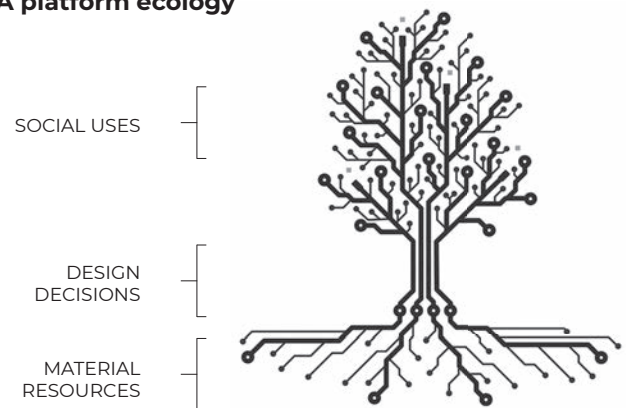
There are clear benefits to this arrangement. Rather than being saddled with aging and ineffective software, schools now have access to platform services that automatically push out new features, updates, and bug fixes. But there is a downside: Platform-based instruction cedes significant control over what happens in classrooms to the whims of platform developers. And the more deeply embedded those platforms become in the everyday life of K-12 education, the more control educators cede. For instance, Zoom or ClassDojo could decide tomorrow to change or disable a teacher-favorite feature, and teachers would have little choice but to adapt.

This is where it becomes most helpful to reconsider how we talk and think about teaching with technology. When we describe platforms as tools, we focus only on their *uses* (as when teachers ask, for example, "What's the best platform for classroom management?"). But when we recognize that platforms like Zoom and ClassDojo provide a whole *ecosystem*, we become more aware of the whole range of factors — from the code that allows them to run, to the business models that drive their features and updates, to the nature of the K-12 marketplace — that shape how we can teach and learn in those environments. Attending to *platform ecologies* in schools and classrooms, then, offers a clearer view of how digital technologies affect education.

### Missing the tree for the leaves

So what does a platform ecosystem look like? Media theorist José van Dijck (2020) has suggested we think of a digital platform as a tree. The various apps and tools that we use

**Figure 1.**  
**A platform ecology**



each day are the tree's leaves. Each of them may seem to be complete unto itself, but they're best understood as part of a larger organism, including the trunk (which gives them structure) and the roots (which gives them nutrients). If we focus only on the specific apps and tools, then we end up missing the tree for the leaves. It's like using a Kindle reader or streaming films from Prime Video without considering their relationship to Amazon or thinking about that corporation's influence on the economy, the environment, popular culture, and so on. You can choose *not* to think about these things, but you're missing an opportunity to better understand the technology you're using and how it affects the world. For schools, we argue, calling attention to the bigger picture isn't just an opportunity but a responsibility.

Building on van Dijck's imagery, we suggest that educators look at digital platforms in three ways, paying attention to their *social uses* (leaves), their *design decisions* (trunk), and the *material resources* they require (roots). (See Figure 1.)

### Social uses

This is the aspect of digital platforms that educators pay attention to most often: How can I *use* this tool? Actually, though, they tend to talk about those tools in two different ways: When teachers ask us about which platforms they ought to select (e.g., "What's a good app for teaching algebra?"), they're referring to the *intended use* of that technology. And when they ask us about how best to manage their platforms (e.g., "How do I prevent students from turning off their cameras and microphones?"), they are talking about the *actual use* of the technology.

Friction between the intended and actual uses of technology is hard to avoid. Students and classrooms are complex and unpredictable, and there's no way to anticipate exactly what they'll do with new resources. For instance, early in the COVID-19 pandemic, most educators turned to platforms like Zoom and Google Meet, whose intended uses promised to replicate key facets of in-person instruction. However, a

number of unexpected variables (e.g., technical difficulties, a lack of in-home privacy, and students' reluctance to turn on their video cameras) affected how they were actually used.

An ecological view of platforms invites educators to acknowledge these frictions and think through their implications: *What is the intended use of this platform, and how is it actually being used? What does this tell us about its benefits and limitations for the sort of teaching and learning I want to promote?*

### Design decisions

An ecological perspective also highlights the underlying design of the platform, which shapes how people can and can't use its specific tools, much as a tree's trunk gives shape to the leaves. How people use a platform like Zoom or Google Meet, for instance, is the result of thousands of choices that have been made during the process of building them, having to do with everything from their overall look and feel to their basic and advanced functionalities, their default privacy settings, and on and on. Long before teachers and students start using a platform, all sorts of *design decisions* have been made already, including choices about the interface (the visual layout and usability of the platform), data management (which information the platform will collect about its users and usage), algorithms (e.g., the formulas that allow it to translate users' data into personalized content), governance (how activities are regulated on the platform), ownership (whose property is the platform and the data it generates), and a business model (how the platform makes money).

While many of these decisions have been made behind the screen and out of educators' sight, they have important implications for how platforms function in classrooms. A clunky interface, for example, may mean students will need more time or support to use the platform. And a change in a platform's business model may hide once-accessible

features behind a paywall. Padlet, a popular resource for teachers to incorporate comments and dialogue in classrooms, has shifted and limited features for teachers as it has expanded its user base in recent years. Similarly, a once-popular teacher social network, Ning, now has a diminished presence in the educational landscape after moving to a subscription model.

Because these decisions are made by human beings, platforms may end up reflecting the personalities and priorities of their creators, which often has important implications for their users. As Safiya Noble (2018) and other scholars have demonstrated, algorithms often inherit biases from their designers, and these biases have a disproportionately negative effect on people from nondominant communities. For instance, Zoom's algorithms for detecting faces and generating virtual backgrounds have been shown to be less accurate for non-white users (Dickey, 2020), making these features more difficult for students and teachers of color to use without seeing their faces disappear from the screen. Similarly, software that gives feedback on individuals' writing may not recognize nonstandard English. The algorithmic design, a process often referred to as *natural language processing*, helps decide what writing and language in schools are deemed acceptable or *unnatural*.

The social uses of platforms aren't easily disentangled from the design decisions that went into them. So it's important for educators to take the time to ask, *What values, biases, and assumptions are at work in the design of this platform? And how do these align with or diverge from my own goals for teaching and learning?*

### Material resources

The experience of using a digital platform can often seem disembodied, taking place outside of the material world of classrooms, chairs, desks, and such. But the truth is that no matter how deeply a platform pulls us into its nonphysical world, it relies on material resources. This is the third aspect of digital platforms that educators ought to consider: What are the hidden resources — the buried roots of the tree — that enable it to function?

For instance, when we send a text message, it just seems to *appear* on somebody else's phone. We don't think about the microprocessors and telecommunications infrastructure that are involved — until there's a glitch. During the COVID-19 pandemic, frustrations with unstable connections, malfunctioning mics, and sluggish hardware made visible what we rarely see: It takes lots of material resources, working in harmony, to make platforms feel immaterial. Importantly, and as the pandemic also revealed, these material resources aren't equally accessible or usable for everyone. Even in one-to-one programs with school-issued devices, a spotty Wi-Fi connection can bring platform-dependent class activities to a standstill or create obstacles for students completing assignments from home. An ecological view of digital platforms, then, encourages educators to consider not just whether



*"I knew all the answers, but I didn't want to show off."*

a given “tool” is useful, and not just the ways it has been designed, but, and more important, what other real-world factors might allow those tools to be used effectively and equitably.

This perspective can also shed light on the environmental impacts of educational technologies. While we often associate the internet with “going green,” experts warn that the exponential growth of platform technologies leaves a substantial environmental footprint (Parks & Starosielski, 2015). Wireless networks and the cloud, for instance, depend on vast networks of undersea cables, telecom wiring systems, and energy-guzzling server farms. And the tablets, phones, and laptops we use? They’re made from rare minerals, mined and processed by people, and (likely) shipped as cargo from another continent. By shifting their focus from tools to ecosystems, educators can better reflect on their resource use, asking, *How do platforms tether classrooms, schools, and districts to particular resources, spending priorities, and consumption habits? And what ripple effects might this have on teaching and learning and on the environment?*

### Teaching technology ecologically

Admittedly, it can be daunting to look at digital platforms this way. It’s a lot simpler and more straightforward just to think of platforms as teaching tools. However, if we do make the effort to look at educational technologies in all three dimensions — paying attention to their social uses, design decisions, and the material resources they require — we can

get a much clearer picture of the ways in which they influence teaching and learning.

At the same time, we can also avoid the *technological determinism* — the idea that any problem can be solved by the right technological fix — that often seduces educational leaders. According to the historian Larry Cuban (1986), this assumption has led teachers and administrators to jump onto one bandwagon after another, from educational radio in the 1930s to educational television in the 1970s, interactive whiteboards in the 2000s, and recent investments in “personalized” learning. Again and again, we’ve convinced ourselves that the right combination (or proper use) of technological tools will finally result in efficient, effective, and equitable education at scale.

By contrast, an ecological view of technology makes it clear that no digital tool will ever “fix” public education or make our schools dramatically more equitable. Inevitably, a device that benefits some students will, at the same time, rely on design decisions and resource needs that make it unsuitable for others. And well-designed apps that help students flourish in some social contexts may fall flat in others, for reasons that have nothing to do with the quality of the technology itself.

To acknowledge these complexities is not to stand in the way of educational progress. Rather, the point is for educators to free themselves from an endless cycle of disappointments, in which the next invention is always supposed to be the perfect, all-purpose teaching tool. Further, if educators adopt a more nuanced view of technology, they will be better able to choose platforms that align with the kinds of instruction they aim to provide.

**Table 1.**  
**Questions for exploring technology use**

Dimension	Questions for teachers	Student inquiry ideas
<b>Social uses</b>	<ul style="list-style-type: none"> <li>• How will this technology shape learning and interaction in my classroom or school?</li> </ul>	<ul style="list-style-type: none"> <li>• How is this technology intended to be used? How do people actually use it? What is the reason for these differences?</li> </ul>
<b>Design decisions</b>	<ul style="list-style-type: none"> <li>• What users did the designers have in mind when creating this technology? How are these potential users similar to or different from my students?</li> <li>• What barriers might the design of these technologies create for students?</li> <li>• Do complicated passwords, color combinations, font size, or technical requirements prohibit some students from meaningful engagement with this technology?</li> </ul>	<ul style="list-style-type: none"> <li>• What does the design of this technology assume about users, their abilities, or their cultures?</li> <li>• What biases (cultural, socioeconomic, racial, ableist, and gender) shape how a person might use or respond to these technologies?</li> </ul>
<b>Material resources</b>	<ul style="list-style-type: none"> <li>• What changes will I need to make in my classroom design and structure to use this technology?</li> <li>• Do students need to be near power adapters or to precharge devices? What happens when devices break or Wi-Fi fails?</li> </ul>	<ul style="list-style-type: none"> <li>• Who made this technology?</li> <li>• What went into the making or operating of this technology?</li> </ul>

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Below and in Table 1, we raise a pair of guiding questions for educators to consider as they take a closer look at the platforms they use.

***How well does a given platform align with our approach to teaching and learning?***

Consider Zoom, for instance. In our recent work with teachers, we have heard much about the day-to-day frustrations of the platform: students and teachers forgetting to mute or unmute their mics, students staying off-camera during class, and the difficulty of using breakout rooms for small-group discussions. An ecological view helps us see that these problems shouldn't be blamed on student misbehavior and technical shortcomings (such as low bandwidth making camera use impossible). Rather, they reflect a mismatch in values: Zoom was designed as a platform for adults to have synchronous meetings, not for teachers to nurture meaningful learning. The friction educators are experiencing is what happens when instruction aimed at the latter is offered through a platform geared toward the former. Recognizing this mismatch can prompt deeper reflection into how different platforms shape and reshape the ways we observe, support, assess, and communicate with students. Further, many teachers may have experienced the frustration of trying to transition a once in-person activity online and spending substantially more time explaining a task, getting students to navigate to the right location, and finding online discussion limited; even school-focused resources like Google Classroom can undercut the instructional goals of teachers.

Importantly, this can also prompt teachers to keep a closer eye on the technical side of the platforms they use, even when the technology seems to be working fine. For instance, eight months before the pandemic, Zoom acknowledged a security flaw that allowed websites to access users' cameras, even if they were not actively using the app (Leitschuh, 2019). In fall 2020, similar issues with Google Meet and GoGuardian sparked a scandal in Chicago public schools (Issa, 2020). Examples like these highlight the need for schools to be proactive about assessing platforms more thoroughly. This means vetting them with an eye toward not only their pedagogical uses (as tools), but also the potentially hidden ethical impacts they could have on classrooms (as ecosystems).

***What should students know about the given platform?***

Teaching technology ecologically also means inviting students to ask questions about the digital platforms they use in and out of school. Rather than simply assigning the use of a particular tool — Zoom, Google Classroom, Epic Reads — educators can support students in analyzing its strengths, limits, biases, and assumptions, and its implications for learning and equity.

For instance, if a class regularly uses video conferencing, teachers might ask students to think about the platform's design decisions, including the ways in which it encourages certain forms of participation and discourages others, or the ways in which it creates distinct challenges for English learners and users with disabilities. Similarly, teachers might call attention to an online writing platform, asking whether its automated grammar-check is aligned with or contradicts their approach to literacy instruction. Or teachers might ask students to compare how they might engage in activities from different disciplines on specific platforms, leading to the insight that the thinking of a scientist or a mathematician is, and has always been, shaped by the tools at hand. The structure of platforms can invite certain kinds of communicative practices that might otherwise focus on written text alone. TikTok and Instagram, for example, emphasize videos and images as the primary way to share material. Placing news images alongside one another as “#PairedTexts” (a popular hashtag) can offer historical perspective on contemporary issues.



IMAGE: GETTY IMAGES

Even seemingly simple questions — *Who made this tablet? Why does Twitter label some electoral statements as “false”? Why are so many tools made in China?* — can be catalysts for powerful interdisciplinary explorations. If we take seriously the goal of preparing students to participate in civic life, then we must teach our students to pay close attention to the platform ecosystems that shape how they interact with friends, neighbors, elected officials, and others in the community.

### Acknowledging complexity

When we shift our perspective from digital tools to platform ecologies, we will become ever more aware of how devices and apps shape our perceptions of and experiences with the world around us. As such, they are ripe for reflection and examination. This is especially true in schools, where teaching, learning, and professional development increasingly depend on platform technologies — something the COVID-19 pandemic has both made visible and accelerated.

The questions we might ask about these technologies do not invite easy answers or one-size-fits-all solutions. Thinking about the social uses, design decisions, and material resources that animate platforms is complicated. However, we suggest that bringing these questions into schools and classrooms offers a rich starting point for inquiry, both for educators as they make instructional decisions and for their students who are learning to understand the world. ■

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