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Toward a school of digital risks?

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Abstract:

The emergence of a “digital culture” is described in terms of its major benefits, problems and risks, which fuel several controversies. The individual now lives in a “connected” society and world. Does this lead to a form of “digital citizenship”? Since citizenship is closely related to the educational system, are our schools capable of introducing this digital culture, not just its positive aspects but also the related risks?

Denis Cristol (2014) has defined *Homo numericus* as the actors in hyperconnected societies who “obtain information on line, play and shop on line, patronize cybercafés, fall victim to cyberattacks, have their digital identity stolen, massively enroll on social networks, search for a mate on the Internet, sign online petitions, share music and photos, telecommute and, too, learn and teach on line”.¹ This *Homo numericus* is immersed in a “capacitating digital ecosystem” that enables him to go about his daily life.² Beyond what has just been said about his digital habits, *Homo numericus* goes on line for music and video on demand, accomplishes administrative formalities on line, and manages his digital assets (photos, videos, papers, books, etc.) or even his grief work on line.³ When he voluntarily disconnects, he might fail to manage the tracks left while browsing. This is, of course, an optimistic vision.

Everyone reacts differently to the digital *pharmakon*, which is both a remedy and a poison, a drug.⁴ Our hyperconnected societies can no longer get along without it. Digital technology sets the paces of our lives, provides tools, measures, amplifies, enlivens, connects, and memorizes the least instant of our lives. So, we have to learn to live in symbiosis with it in this digital ecosystem so as to rid us of its poisonous effects, limit its impact as a drug and make it a better remedy. The obvious starting point for doing this is to provide, from the youngest age, an education in digital technology. This education should use quality digital technology and adopt an ecological approach consistent with the phases of the young person’s development. This article sketches what we might call a “digital culture”,⁵ but first let us discuss the major benefits, problems and risks that fuel the many controversies surrounding digital technology. In conclusion, I shall come back to this question of introducing digital culture in schools and of the positive effects to be expected of an education at school on “digital risks”.

¹ This article, including quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor’s approval, completed a few bibliographical references. All websites were consulted in May 2020.

² As “acting objects” or “capacitating objects” with the power to act (LATOURE & BIEZUNSKI 2010).

³ VoD, a service offered by TV stations and content-providers like Netflix, allows users to choose the programs they want to view and the time to do so. Some websites (e.g., <http://www.votredeuilenligne.com/>) offer “commemorative packages” for families whose members are scattered. They help them to keep informed, to share and support, to access the family’s genealogy, etc. from a joint online space. This digital memorial for the departed is a memorial in both senses of the word: a website with illustrations and texts as a souvenir and a virtual monument to be visited.

⁴ For Bernard Stiegler (2007), a *pharmakon* is “both a remedy and a poison according to Plato, who also said that any technique is a ‘pharmakon’, any technique used to build, devise or raise the world or else destroy it (as Oppenheimer said about the atomic bomb, but this holds for any technique).”

⁵ Translator’s note: In French, the word *culture* is often used ambivalently, sometimes referring to “culture” as in English, sometimes to “education” (often in the broad sense of upbringing), but usually referring to both at once.

Benefits

Our sensory experience of the world comes from using our five senses in analog mode to perceive phenomena continuous in time and space. In this world, nothing is lost. Changes follow the law of conservation of matter and energy. In the digital realm however, the electronic transformation of a signal always involves a compromise between the signal's quality (and thus the decision to diminish or restore its quality, as in the case of music and video) and its "weight" (in bits or bytes). When the quantity of bytes increases, transmission takes longer, more space is needed for storage, and processing time increases.

Our everyday experience of digital technology soon convinces us of the benefits. We communicate more, faster, farther, everywhere. We gain time, money and living space, since the media used are dematerialized and, thus, cost somewhat less and take up less shelf space. This holds for music, books, newspapers, films, etc. Our cultural holdings tend to amount to a simple USB stick (or online storage space), since our leisure activities, souvenirs and administrative papers are so easy to archive and transmit in a digital format.

Beyond smartphones and the Internet, digital technology is present everywhere, in all automatic control mechanisms inside machines. It sees to the security and operation of airplanes, cars, driverless vehicles, etc.⁶ Robotics has benefitted significantly from its potential. Handling heavy weights and performing household chores will soon be left to robots. Moley's robotic kitchen can select from more than two thousand recipes.⁷ Biomechanics is restoring lost mobility thanks to prosthetic devices for legs that are unnoticeable under clothing because the person's gait looks natural.⁸ Considerable progress in the field medicine can be chalked up to digital technology: medical imaging, telemedicine, surgeon robots, etc. This technology helps save or prolong lives: body implants in cardiology, sensors, capsule cameras for endoscopy, etc.

Leisure and cultural activities have also benefitted from digital technology.⁹ By making available to everyone an infinite number of resources on a variety of media, this technology makes it possible and easy for us to improve our level of culture (scientific, literary, musical, political, etc.). According to André Tricot,¹⁰ *"the time spent reading per day rose from 1 hour and 46 minutes in 1972 to 4 hours and 30 minutes in 2010, 30 minutes of this being devoted to digital correspondence — an increase of more than 250%."* Average reading time has never been so high. To simplify, we can set this potential gain in culture and education down to digital technology. I could continue listing the benefits of digital technology. In this respect, digital technology can rightly be called a major transformation, even a revolution, especially in sectors such as medicine. But every coin has a flip side...

⁶ See the video (<https://www.youtube.com/watch?v=WLjlsZMSQBQ>) about the Renault Symbioz, a proof-of-concept all electric car that provides a glimpse of automobiles in 2023. Auto Moto is testing it on superhighways and has even made it pass through tollbooths in driverless mode.

⁷ Cf. <https://www.youtube.com/watch?v=kjU8DLZY6xE&list=PLYb44pAPY8xgnITKUOR3kl9eXp0Evs8gJ&index=4&t=0s>.

⁸ See the amazing video (https://www.youtube.com/watch?v=rEKe_SHTgal) about Hugh Herr, the "bionic" man who climbed mountains after having lost his two legs.

⁹ In French, the author has used *le Numérique* to refer both to a systemic view of the digital era in which we are living (to the "making of society" in the digital era) and to the concepts of "digital culture" and "digital citizenship". It thus encompasses digital technology as a tool and medium.

¹⁰ P. 11 from information about his intervention during a conference at CANOPE, Montpellier, in 2017.

Problems and risks

The digital era started at the end of the 20th century in a hypermodern, polluted world deeply based on an excessive consumption of products and energy. All sorts of inequality abounded, including in access to education and work¹¹ and, therefore, to the financial means needed to live a “good life”. Though not at the origin of this situation, digital technology took its origins therein and inherited many of these social problems even as it came up with solutions. As an ecosystem, it is accompanying our lives. Like any technology, it has brought us risks with which we are learning to live in everyday life. The changes it has wrought have given rise to physical, environmental, ethical, institutional and political problems. In this “risk society” (BECK 1992), risk has become a full-fledged part of ourselves; and risk management and prevention have become an economic, social and political imperative.

For example, cars make it easier to move, find a job farther from home, travel, etc.; but they have brought the risks of pollution and congestion in urban areas and of casualties on our highways.¹² A national policy of oversight and prevention has been worked out to handle these risks, which have been socialized and brought to public awareness: driving licenses, mandatory seatbelts, air pollution controls, technical measures (catalytic converters, car inspections), speed limits, etc. We use our vehicles day after day without having to think about all of this, because we have accepted that accidents and pollution are the price to pay for the service obtained. As much can be said about digital technology: society has accepted to put it to use in many ways that have been socialized or even “normalized”, such as e-mail, the social networks or online browsing for information or entertainment. However this recent trend has a global dimension; and it is not at all easy to socially organize and supervise the many risks related to it. Besides, we are not necessarily aware of these risks, and they lie beyond our control.

Should we imagine a “driving school” for teaching cybercitizens how to browse and behave in this new realm? Should *Homo numericus* pass a digital driving license before browsing in cyberspace? Should he be reminded to put on a digital seatbelt, see to the maintenance of his digital devices for the sake of security and minimize his personal environmental footprint? Should he also have to learn how to slow down in a speeding society, where stress is becoming a pathology typical of our era with as symptom a sense of urgency (AUBERT 2014)? For driving a car, all of this is a matter of the individual’s decision to learn. So, we might reasonably imagine that the appropriation of digital technology by society should entail, and be subject to, a national “digital culture” that is yet to be defined and placed on the curriculum of our schools. I shall come back to this point in conclusion.

Let us now look at the major risks that information and communications technology (ICT) has brought to humanity, increasingly so over the past twenty years.

¹¹ At the end of the 1990s, the unemployment rate was exceptionally high in France, more than 12% (<https://www.ladocumentationfrancaise.fr/dossiers/emploi/chiffres-cles.shtml>).

¹² According to ONISR (Observatoire National Interministériel de la Sécurité Routière), 238 persons died, and 5036 were injured in January 2019.

Major social and political risks

OVERCONSUMPTION OF ENERGY: The Internet's infrastructure — datacenters, nodes, servers, etc. — consume between 6% and 10% of electricity worldwide (CALLICOE 2018).

SHORTAGE OF RARE EARTHS: Electronic devices contain rare earths and scarce minerals (graphite, cobalt, indium, etc.). Extracting these substances causes severe pollution (PITRON 2018).

ELECTRONIC WASTES: Electronic devices are soon obsolete. For instance, we change our smartphone “on the average every two years, whereas, in 88% of the cases, they still work”.¹³ In fact, most mobile telephones end up in a drawer and are not recycled. After all, recycling electronic devices is expensive.

AUTOMATION AND THE EXTREME TAYLORIZATION OF JOBS: The race to be competitive and the generalized acceleration of transactions stimulate profit-seeking and thus the offshoring and automation of jobs. Digital technology downgrades certain occupations and facilitates automation: 15% of French wage-earners could be replaced with robots (LE RU 2016). In any case, as everyone knows, new jobs appear (e.g., cybersecurity specialists) while other jobs (lathe operators, cobblers, etc.) disappear.¹⁴

DEEPER INEQUALITY (in the access to materials, networks and resources). Besides the costs of equipment and subscriptions for access to digital technology, let us not forget the training necessary for becoming a “digital citizen” — a *Homo numericus* with a digital driving license.

UBERIZATION: Joseph Schumpeter (1942) described the disappearance of economic activities following the appearance of new activities as “creative destruction”. “Uberization”, a neologism for this process, is derived Uber, a firm that has organized worldwide an online platform for renting the service of a vehicle with a driver, an activity that directly competes with taxis. Uberization has upended the process of bringing drivers and users into contact, and carved out a new market of services at a lower price thanks to digital technology.

ABETTING TERRORISM, TRAFFICKING AND DEPRAVATION: The Internet is a fabulous means for instantaneous communication on the planet. Its basic version had little security, but so many techniques and procedures have been added that using it has nearly become untraceable. With a proxy server (which masks the user's Internet address with its own address, which is hard to track) and a Tor browser,¹⁵ browsing becomes untraceable. Users can even gain access to the darkweb, the Internet of illegal activities that search engines do not reference. Everything can be found on this web: trafficking in illegal medication, drugs, weapons and even human beings: sexual services, organs for transplants and “contracts” for terrorist actions (CARTEGINI 2018).

DIGITAL PIRACY on all scales, from the small-time pirate who extorts (or “sextorts”: SOYER 2018) a few hundred euros (from a victim whom he has led to believe that he has compromising webcam recordings) to full-sail piracy (which attacks a multinational firm that cannot remain off line for long, since its sales per minute are so high). Take the example of Amazon's sales in 2017: \$178 billion, thus \$20.3 million per hour, \$339,000 per minute or \$5,640 per second. There have also been acts of piracy for political purposes, for instance to manipulate voters during an election (e.g. Cambridge Analytica).¹⁶ Other potentially interesting targets for high-tech piracy and industrial espionage are R&D laboratories, high-frequency traders, banks and government services.

¹³ See <https://presse.ademe.fr/2017/09/smartphones-des-telephones-pas-si-smart-pour-lenvironnement.html>.

¹⁴ For a long list of these future jobs, see https://www.levif.be/actualite/sante/quels-metiers-vont-apparaître-d-ici-2030/article-normal-362615.html?cookie_check=1551440077.

¹⁵ The Tor browser is based on the untraceable Tor protocol, which uses a network of dedicated hosting services. The American armed forces worked out its basic principle in the mid-1990s in order to protect the eavesdropping and wire-tapping of online traffic. Cf. <https://www.torproject.org/projects/torbrowser.html.en>.

¹⁶ Another more recent example: UNTERSINGER M. (2018) “Comment une entreprise proche de Trump a siphonné les données de millions d'utilisateurs de Facebook”, *Le Monde*, 18 March, at https://www.lemonde.fr/pixels/article/2018/03/18/comment-une-entreprise-proche-de-la-campagne-de-trump-a-siphonne-les-donnees-d-e-millions-d-utilisateurs-de-facebook_5272744_4408996.html.

DISINFORMATION: Once Web2.0 was introduced at the start of the 21st century, everyone had within reach a potential close to that of the mass media: diffusion on a large, even worldwide, scale of audiovisual works and hypertext. Since then, everyone can have his online news, television and radio. News and information instead of being published by a recognized source now come from everyone. Everyone now produces information everyday, with more or less accuracy and relevance or even with flagrant, dishonest and malevolent errors (*fake news*).¹⁷ It is becoming harder and harder to wend one's way on the Web and judge the information there. This calls for a new discipline in our schools and for citizens to learn: an education in the media and Internet (EMI). This discipline is gradually being introduced in the curriculum from middle schools to universities. Several teachers have made it their hobbyhorse and guideline for planning lessons.¹⁸ A digital driving license is important, like a high school diploma is a license for further studies.

Major health risks

EXPOSURE TO ELECTROMAGNETIC WAVES: Since the mid-20th century and the advent of pirate radio stations, radiotelephones, television, satellites, etc., humanity has been bathing in an atmosphere filled with radio waves. The frequencies emitted by portable telephones are close to those emitted by microwave ovens, which have the property, if the source is nearby, of heating cells through molecular movement. This warming might cause cancerous tumors in persons who intensively use portable telephones (especially for calls).¹⁹ Since 27 March 2018, the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) has recognized the symptoms related to electromagnetic hypersensitivity (EHS). However it did not recognize a causal link to the exposure to electromagnetic waves.²⁰ So, EHS is recognized and treated, but the cause has not been ascertained. ANSES had already pointed out in a report in 2016, the "*possible effects on the cognitive functions and well-being*" of children; and advocated a "*moderate, supervised use*" of this technology.²¹ Caution is always worthy of consideration.

SLEEP DISORDERS: According to a 2015 survey,²² 28% of the 219 primary school pupils and 82% of the 407 middle school students had mobile phones. Furthermore, 26% of the middle school students who had a mobile phone left it on and connected nearby during the night; and half of the parents of 8-13 year-olds did not control whether their children kept their phone in their bedroom overnight. While the recommended sleeping time for 6-13 year-olds is from nine to eleven hours per night,²³ 17% of the primary school pupils went to sleep after 10 P.M. during the week; and 20% of the middle school students, after 11 P.M. They thus lacked from one to three hours of sleep per night. This sleep debt is to be set down to the use of digital screens, mainly smartphones. In an

¹⁷ A well known example during the preparation of C2i: <http://site.ulco.free.fr/c2i/>.

¹⁸ See this article in the newspaper *Ouest France*:
<https://www.ouest-france.fr/medias/point-de-vue-que-peut-l-ecole-face-aux-fake-news-6237999>.

¹⁹ On this controversy, see the article in *Sciences et Avenir*:
https://www.sciencesetavenir.fr/sante/e-sante/les-ondes-des-portables-sont-elles-dangereuses_129232.

²⁰ For ANSES's recommendations, see:
<https://www.anses.fr/fr/content/hypersensibilite-C3%A9-aux-ondes-C3%A9lectromagn-C3%A9tiques-amplifier-l-E2%80%99effort-de-recherche-et-adapter-land>. This sensitivity extends to the exposure to radio frequencies from, among other things, portable telephones, base-station antennas and WiFi. The major recognized symptoms are: headaches, sleep disorders, nausea, irritability and prickly fingers. See: https://www.sciencesetavenir.fr/sante/electrosensibilite-que-dit-la-science_29437.

²¹ Cf.: the report on the exposure of children to electromagnetic waves at
<https://www.anses.fr/fr/content/exposition-des-enfants-aux-radiofr-C3%A9quences-pour-un-usage-mod-C3%A9r-C3%A9-et-encadr-C3%A9-des-technologies>.

²² A survey carried out by students at Lycée Jeanne d'Arc (2016) between September 2015 and March 2016: "Le sommeil. Pays des écrans en veille" 36p., available via
<http://sommeilenfant.reseau-morphee.fr/wp-content/uploads/sites/5/2018/08/synthese-enqueteecransetsommeiljda-v8-160312090506.pdf>.

²³ Cf: <https://www.sleepfoundation.org/excessive-sleepiness/support/how-much-sleep-do-we-really-need>.

interview, Sylvie Royant-Parola, a psychiatrist specialized in sleep disorders, stated: *“Among children, sleep debt can lead to growth disorders. On the cognitive level, it can disturb language learning. [...] Another consequence: attention deficit disorders. Children are then either tired or hyperactive. In either case, they have trouble following what is done in the classroom and might have educational problems.”*²⁴

ATTENTION DEFICIT DISORDERS AND THE ATTENTION ECONOMY: Attention deficit disorders are, as pointed out, often linked to a sleep debt. Sylvie Royant-Parola went on to declare: *“The lack of sleep alters the adolescent’s brain by decreasing the volume of grey matter with effects on attention, concentration and the capacity for performing simultaneous tasks”*. Attention is a filter that enables us to concentrate on a task, even in a disturbing environment. According to Jean-Philippe Lachaux (2015), our capacity for attention keeps growing till the age of twenty, is then stable and then starts declining after sixty. We should, therefore, tame and train our attention by resisting distractions (e.g. constant notifications from smartphones) and the circuits for easy rewards. We should wilfully orient our attention. This ability is developed through exercise; it is not a predetermined genetic asset.

Should schools help develop this ability to pay attention during an era of digital distractions? Whatever the answer might be, the “attention economy” is now expanding and sweeping us up via ICT. Video games, apps, websites and social networks have adopted strategies for capturing us and our attention so that we browse as long as possible and come back often. According to Tristan Harris, an engineer at Google, *“Millions of hours are just being stolen from people’s lives [...] The firms in Silicon Valley are manipulating us to make us lose as much time as possible on their interfaces.”*²⁵ Yves Citton, professor of literature, is more optimistic. While arguing that the *“oversolicitation of our attention has become a central problem for ethics, educational reforms and political actions”*, he does not see digital technology as condemning us to a state of *“dazed dissipation”* (CITTON 2014). The *“fundamentals of an ecology of attention”* should help us be reasonable in dealing with the *“overoccupation that overwhelms us”*. This “ecology of attention” during an era of digital distractions should be part of a national program of digital education — a skill to be acquired in order to pass a digital driving license.

HYPERCONNECTION, BURNOUT AND DISCONNECTION: To define these concepts and show how they are interrelated, I would like to quote from the research program coordinated by Francis Jauréguiberry (2014): *“hyperconnection (always being connected) to ICT seems to arouse, in turn, the desire to disconnect [...] which] appears because there are too many connections, too much linking, too many queries, too much simultaneity, too much noise, too much information.”* Among the principal findings is that voluntary disconnection *“stems from the determination to not be sucked up in an uncontrolled whirlpool of news and communications. [...] Disconnection nearly always occurs in situations of saturation, too-much information, cognitive overflow, harassment or surveillance, when individuals feel overwhelmed or subjugated [...] Disconnection is never irreversible, is always temporary, in fits and starts in contexts of saturation or overflow. The intent is not to give up ICT but to try to control it by switching, standing back, creating time buffers.”* When disconnection fails to work and leads to *“extreme cases of burnout, rejecting ICT fully reflects an attitude of ultimate defense so that the individual can survive when he can no longer put up a fight. [...] Like a circuit-breaker that flips off when the intensity of electricity is too important, disconnection is, in this case, purely reactive”* (JAURÉGUIBERRY 2013).

²⁴ Cf.: <https://www.la-croix.com/Famille/Parents-et-enfants/enfants-besoin-regularite-2018-01-23-1200908168>.

²⁵

<https://www.nouvelobs.com/rue89/rue89-le-grand-entretien/20160604.RUE3072/tristan-harris-des-millions-d-heures-sont-juste-volees-a-la-vie-des-gens.html>.

In France, the El Khomri Act of 8 August 2016 established the wage-earner's "right to disconnect": *"the possibility, outside working hours, to temporarily turn off the digital means (smartphone, the Internet, e-mail, etc.), whereby he can be contacted for job-related reasons"*.²⁶ For example, the automobile firm Volkswagen has required, as of 2011, that its employees block their e-mailbox between 6:15 P.M. 15 and 7:00 A.M..

"SCREEN ADDICTION": The Larousse medical dictionary defines addiction as a *"process of more or less alienating dependency on toxic substances or behaviors. Addiction is a process whereby human behavior yields to immediate gratification while reducing an inner feeling of anxiety. It entails the impossibility of exercising control over this behavior despite an awareness of its negative consequences."*²⁷ Referring to the well-known addictions to alcohol, tobacco, narcotics, and even foods, this definition goes on to mention the *"irrepressible, excessive need of behaviors such as pathological gaming (gambling or video games), the unremitting use of the Internet or of a telephone"*. This definition encompasses even sexual intercourse or compulsive buying. A distinction thus appears between pharmacological addictions (with substances) and the behavioral addictions (without substances) of relevance to us.

According to CUNEA, *"behavioral addictions are characterized by the impossibility of controlling a behavior (such as gambling or gaming, sexual activity, the use of the Internet, purchases, physical exercise) and the pursuit of this behavior despite the occurrence of negative consequences."* Apart from gambling disorder, which figures in international classifications, the other addictions of this sort need, *"according to current scientific data, more research to determine whether these disorders are to actually be considered addictions and, if so, what their diagnostic criteria might be"*.²⁸ The question of whether or not such behaviors constitute an addiction hinges on the definition of these criteria.

Instead of addiction, Serge Tisseron prefers referring to the "toxicity" of a product, game or digital screen, a toxicity that has to be dosed and indicated.²⁹ Since no withdrawal syndrome or relapse has been observed among the people with these behaviors, it is hard to talk about addiction. This psychologist makes the biological distinction between "circuits of pleasure and of addiction", the latter not involving the same hormonal interactions. The debate about an addiction to "digital screens", the Internet or video games has not yet been settled. Given the controversy about the addiction to, or toxicity of, ICT, it is worthwhile taking account of users' feelings and ideas. Do they feel addicted to screens?

According to a survey of 1200 parents and their adolescent children (FELT & ROBB 2016), 59% of the parents thought their adolescents were "addicted" to their smartphone; and 50% of these adolescents said they felt addicted. In addition, 27% of the parents in the survey also felt addicted to their smartphone, and 28% of their adolescent children thought their parents were addicted. This family experience apparently speaks for itself: ideas about addiction to the smartphone are clearly shared and voiced. Furthermore, 66% of the parents thought that their adolescents spent too much time on their mobile phone, a remark confirmed by 52% of the adolescents. This led to arguments and tensions several times a week for 43% of respondents, or even every day for 36%. "Screen addiction" thus seems to be a new experience that is felt both personally and socially, depending on how reasonably screens are used and how this use interferes with the relations to others. This phenomenon is, therefore, relative to the context.

²⁶ On the act of law: <https://droit-finances.commentcamarche.com/faq/52536-loi-el-khomri-loi-travail-ce-qui-change>. On the right to disconnect: <https://droit-finances.commentcamarche.com/faq/56221-droit-a-la-deconnexion-definition-et-exemple>.

²⁷ Cf.: <https://www.larousse.fr/encyclopedie/medical/addiction/185204>

²⁸ Cf.: CUNEA [Collège Universitaire National des Enseignants d'Addictologie], lesson 77 available via <http://www.cunea.fr/sites/default/files/ecn77.pdf>.

²⁹ https://www.huffingtonpost.fr/serge-tisseron/jeux-video-addiction_b_5117191.html.

I would like to propose a caveat about the harmful effects of digital technology and screens that has been presented. Let us remember that most health-related risks (such as sleep disorders and their effects) can also be set down to activities that are not digital. We need but think of “avid” consumers who read paper editions of books, listen to music or play an instrument, “enthusiasts” who paint, draw or even practice astronomy, and “hobbyists” of many sorts. The hours do not count when an activity is practiced with enthusiasm and devotion; but such an activity might affect sleep or relations with other people.

Digital technology holds the magnificent possibility of making us feel entertained and want to spend time just like many other activities do too; but this should not be confused with, or interpreted as, a command to overconsume. I tend to see this as a question of uses — to borrow a phrase from Yves Citton (2014), an “ecology of uses”. We thus come back to the question of the “toxicity” of uses — to the “*philosophical study of ‘pharmakons’*”.⁴ Putting this ecology of uses into practice so as to neutralize the toxicity inherent in screens and ICT requires an education adapted to the digital ecosystem. This education — what I have called an “ecological digital culture” — should be defined at the national level and shared by all digital citizens.

An ecological digital culture

Since about 25 years ago, our cultural heritage has a new traveling companion: digital technology. Culture in the sociological sense of what is in common to a group of individuals has thus been enriched. In the same way as we talk about an education or culture in music or the arts, we can now talk about a French (and planetary) digital culture:⁵ *“the digital culture is, therefore, the integration in culture, owing to the development of digital technology, of actual or potential changes in forms of relations, sociability, identity, information and occupations. It is close to the information culture, since it relies on exchanges of information. It stands out because its center is not information but the social network and the individual who exchanges this information”* (DEVAUCHELLE *et al.* 2009). Ten years later, the full importance of this was in print on the front cover of Dominique Cardon’s (2019) book; *“If we make digital technology, it also makes us. That is why it is indispensable for us to make a digital culture.”*

A culture seems to be emerging before our very eyes. I have described this digital culture as ecological. It is a new way of “making a society” in this hyperconnected digital ecosystem, where we have to rediscover human beings and their needs for disconnection, introspection, reflection, for long periods of time. We have to learn to momentarily “burn the bridges” in a world where *“the permanence of ties to others is now the norm”*, even when we are mobile (JAURÉGUIBERRY & LACHANCE 2016). This ecological digital culture is constituted by forms of awareness: *“to know how to talk to machines and understand them, how to interact with the world via machines (opening a window onto the world), how to develop and learn throughout life, how to be a responsible digital citizen capable of protecting his digital life and legacy. Experiencing this culture means taking the better of both worlds and coexisting in a state of equilibrium between a tangible, physical universe (uncertain, anagogical and complex) and a digital algorithmic ecosystem (adaptational, cozy and predictable) in order, ultimately, to relearn how to find ourselves and live in harmony with others in a connected world”* (CÉCI 2019).

Digital citizenship

According to the Larousse dictionary, citizenship is the “*situation of persons in a state who have been recognized in possession of the plenitude of their civil rights*”. It is exercised in full when the individual reaches adulthood and has responsibility for his actions and choices, and for the obligations inherent in them (working, paying taxes, voting, etc.): “*Being a citizen in 2018 necessarily means performing this role by taking digital technology into account, whether or not as an actor. Schools thus have no other choice than to educate men and women who will be capable of coming to grips with the issues of the digital era.*”³⁰ Citizenship is exercised through a common culture and in a territory. Digital citizenship refers to a citizenship exercised in a state where people share a national digital culture. For society to “construct” tomorrow’s digital citizens (this *Homo numericus* adept at handling this technology and exercising citizenship), the prerequisite is to define this common digital culture and then to educate future citizens so that they adopt and appropriate it among their rights and obligations and in their lifestyles.

Failing that, youth is undergoing a second birth via digital technology during adolescence. Young people are forming their own digital *habitus* without appropriating the ideas necessary for citizenship or while overlooking realities that necessitate societal oversight and adequate schooling. After all, “*The young people in our survey spent on the average 5 hours and 40 minutes per day looking at screens. This amounts to 2060 hours/year, on the average: 90 days. In other words, these young people spend on the average a quarter of their lives on screen. A school year amounts to about 1000 hours of courses (variable depending on the grade level). So, every year, these young people spend twice as much time on their screens as at school*” (CÉCI 2018). This quarter of life that is now digital should at least be organized to help young people grow up in an ever more connected world.

A school of digital risks?

To fully enjoy digital citizenship, people have to be capable of appropriating this common digital culture, once it has been defined. This implies continual education and training for today’s citizens and an education to be dispensed by schools for tomorrow’s — an ongoing crosscutting digital education, just like for French, which is practiced in all fields of study. This is far from being so nowadays. As a survey of five schools in Pau in 2017 with responses from 792 pupils and 153 teachers in the same classes has shown, “*the integration of digital technology in education at schools is, in general, low*” (CÉCI 2018). Once schooled about the benefits and risks of digital technology, these new, future citizens will be able to pass their digital driving license and browse in full security (with the vehicle corresponding to their license) on the highways and superhighways of information systems.³¹

The question of defining this common digital culture is hanging. This culture should be as environmentally friendly as possible — ecological in the sense mentioned at the start of this article (as respectful as possible of human beings and of the individual’s humanity). I would like to conclude with the Council of Europe’s more elaborate definition of digital citizenship: “*the competent and positive engagement with digital technologies (creating, working, sharing, socializing, investigating, playing, communicating and learning); participating actively and responsibly (values, skills, attitudes, knowledge) in communities (local, national, global) at all levels (political, economic, social, cultural and intercultural); being involved in a double process of lifelong learning (in formal, informal and*

³⁰ PETIT B. (2018) “Construire sa citoyenneté à l’ère numérique”, Éducation Canada, <https://www.edcan.ca/articles/construire-sa-citoyennete-a-lere-numerique/?lang=fr>.

³¹ Pix (<https://pix.fr/>) is an official online public service for “*leading each of us to develop digital skills throughout life*”. It represents an initial response to the problems discussed herein.

*nonformal settings) and continuously defending human dignity.*³² The question to be addressed is to define this national digital culture and educate tomorrow's digital citizens so that they fully use the potential of ICT while being aware of the risks for the digital ecosystem itself and for the world where we live.

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³² "Digital citizenship and digital citizenship education" available at <https://www.coe.int/en/web/digital-citizenship-education/digital-citizenship-and-digital-citizenship-education>.