

INTERNET LITERACY – CYBERCRIME FUNDAMENTALS

Alexandru TĂBUȘCĂ¹

Silvia-Maria TĂBUȘCĂ²

Abstract

During the last years the term “literacy” began to apply more and more to much complex and newer things than its old, consecrated, meaning of “knowing to read and write”. Nowadays true literacy means one is able to use a computer at least for office work, to understand basic concepts about computers and computing in general, to be able to safely use social media platforms and to have basic knowledge about cyber-threats.

This topic became even more stringent since children of very young age are also exposed to the internet through various devices. Even though the use of such devices is usually a positive thing, quite a lot of them being introduced officially in formal and informal academic programs and curricula, their intrinsic capabilities and features can transform them into potentially harmful devices.

The ideal thing would be to create and implement mass-programs, in all countries, in order to dramatically increase the level of awareness regarding the possible (basic) threats that could very easily be encountered when using the “Swiss knife” of the current era – the internet. The more one knows about the potential dangers, the more one is able to counter its effects, as well as educate others in the same topic.

Keywords: computer literacy, basic cybersecurity, cybercrimes

JEL Classification: I21, L86, M15

1. Introduction

During the last years the term “literacy” began to apply more and more to much complex and newer things than its old, consecrated, meaning of “knowing to read and write”. Nowadays true literacy means one is able to use a computer at least for office work, to understand basic concepts about computers and computing in general, to be able to safely use social media platforms and to have basic knowledge about cyber-threats.

¹ PhD, Assoc. Professor, School of Computer Science for Business Management, Romanian-American University, Romania, alex.tabusca@rau.ro

² PhD, Lecturer, Director of The Center for Human Rights and Migration, School of Law, Romanian-American University, Romania, silvia.tabusca@rau.ro

This topic became even more stringent since children of very young age are also exposed to the internet through various devices. Even though the use of such devices is usually a positive thing, quite a lot of them being introduced officially in formal and informal academic programs and curricula, their intrinsic capabilities and features can transform them into potentially harmful devices.

The use of a home-device like a webcam is basically a positive action, the use of a modern IoT device to help supervise the perimeter or the activity taking place there. On the other hand, the same device can become a threat in case its internet connection access is flawed, and a malevolent actor can get access (either through a backdoor, a programming error or a connection protocol one) to the webcam. This situation can have very important negative repercussions, from privacy issues to plain theft, robbery, or other crimes.

The ideal thing would be to create and implement mass-programs, in all countries, in order to dramatically increase the level of awareness regarding the possible (basic) threats that could very easily be encountered when using the “Swiss knife” of the current era – the internet. The more one knows about the potential dangers, the more one is able to counter its effects, as well as educate others in the same topic.

2. Literature Review

The new paradigm of “digital literacy”, in our opinion, has two most important approaches – two slightly different points of view. The first one would be the understanding of the term from the point of view of the employers, while the second one would be the term’s understanding from the general public side.

While a potential employer would emphasize the knowledge regarding “job skills”, comprising of course at least basic cyber-security knowledge but mostly focusing on IT skills to help in day-to-day tasks (e.g., Office-like skills, basic database usage, search algorithms understanding etc.), the general public (the overall society) would focus more on the basic cyber-security knowledge, in order to primary and foremostly protect the individual and not a company/employer.

The employer would favor more specific skills (even linked to different specific areas), while the general public would favor more general-knowledge items, being relevant regardless of a specific job area.



Fig. 1. Different terms within the digital literacy umbrella³

2.1 Digital Literacy from the Employer Point of View

Looking at the paradigm of “digital literacy” from the employer/company position, Joaquim Miro⁴ considers that the concept is based on four main pillars, centered around different skills that the employees should have:

- Employees should be able to stay up to date with the evolving technology.
- Employees should be able to properly communicate and make use of the specific tools within the online environment.
- Employees should be able to manage their ideas in the online environment.
- Employees should be able to manage their teams by leveraging the current technology available to them.

Another actor in the field, Matt Dunne⁵, considers the term under the following informal definition:

“Digital literacy refers to someone’s ability to use IT and digital technology to find, evaluate, create and communicate information. If an applicant claims to have digital literacy skills, I’d expect them to be able to conduct thorough online research, which they can then analyze and evaluate. I would also expect them to be capable of creating a range of different digital documents and to use digital communication systems.”

³ Source: <https://www.eschoolnews.com/featured/2018/08/08/8-essential-qualities-of-a-digital-literacy-curriculum/>

⁴ Founding Partner, Hoppin’ World, <https://hoppin.world/>

⁵ Hiring Manager, <https://www.healingholidays.com/>

We should also mention that in today's business environment there are some elementary knowledge, such as web browsing, search engines or social media platforms, that cannot actually count as "skills" anymore. These things are nowadays considered as almost a given and they bring no advantage to a potential employee, but they become a huge disadvantage in case they are missing.

Of course, the concept of digital literacy from the point of view of the employers is also biased based on the specific field of activity. For example, in creative roles (digital marketing, audio-video production etc.) digital literacy would comprise knowledge on operating at proficiency levels with dedicated software like Adobe Creative Suite or Corel Draw Graphics Suite. In research activities positions one would be considered as digitally literate when one is able to evaluate legitimacy and truthfulness of different online data sources, when one can put together a research-study based on a methodology etc.

Nonetheless, after studying vast amounts of literature in the field, we can map out a set of general skills that (most) companies/employers agree on to be part of the digital literacy concept. These general knowledge items are listed below:

Independent-led research capabilities

Much of the digital literacy concept is actually based on self-research and self-teaching. Even with a formal background in technology, keeping up-to-date means you must always check new things, read, test and apply new concepts and approaches. An employee is expected to figure out how to work with new, updated, technologies, by doing independent research on the topic, solving at least the basic problems related to it and becoming adapted to the new technology. Such a skill would be very high on the employers' lists, because besides the pure technical quality it also shows a general pattern of critical thinking and problem-solving skills that are extremely valuable for all fields of activity.

Experience with common IT&C terms and online platforms

Employers do not expect everyone to be able to write code/programs, configure hardware equipment or install operating systems. Being able to cope with most of the terms encountered by an average user of the internet is an expected skill. Also, capabilities to work with office-like applications (either the original Microsoft version, or Google Suite or any other similar counterpart) are expected from a "good" employee.

Collaborative work capabilities

Quite contrary to the movie-like approach of the lonely computer genius, the vast majority of today's technology users are expected to be able to work collaboratively. Most of the

employees will be part of a team, which will conduct its activities at least partly based on remote cooperative platforms and/or project management and supervision tools.

Even if the employee discovers a new collaborative platform in use at the new workplace, his prior knowledge and experience in the field will help immensely in becoming adept with it very soon.

Adaptability to new technologies

Another very important element of the digital literacy paradigm, for employers, is the capability of the employee to adapt quickly to new technologies. Although we humans appreciate attaining a certain level of comfort in our daily work and the related processes, it is crucial to recognize the continuous evolution of technology around us. As new tools, technologies, and software emerge, being adaptable and comfortable with making adjustments in our work/personal routines becomes essential.

Capability to explain your use of technology tools

Such a capability would be a big plus for the digital literacy pack of an employee, perhaps saving time and resources for the company. If one is adept not only at using technology for the job, but also at explaining and even teaching others about this, he might be of tremendous help to the employer. He might cover, at least partially, different learning processes for newly hired personnel, processes that would require the allocation of dedicated resources (money, time, work-force, spaces etc.).

Most of the digital literacy skills mentioned above are not solely confined to “pure” IT&C technology. However, when utilized in the digital environment, they become invaluable assets for today's workforce. One of the most thrilling aspects of digital literacy for future employees is its lack of limitation to particular technologies or systems. The proficiency to embrace new technology is in itself a skill that improves with each mastery of a new platform, software, or service, and it can be carried over to any future new job environment.

2.2 Digital Literacy from the General Population Point of View

Switching back to a broader view, the most widely accepted, though informal, definition for the “digital literacy” is the ability to use a computing device and digital technologies effectively. As the internet access became a “given” in modern societies, something that was pioneered as a public service since the start of the current century – with Estonia passing a law that declared the Internet access as a fundamental human right in 2000 and with Finland stating broadband Internet access is a civil right starting on July 1st of 2010

[1], the literacy in the field of IT&C became more and more relevant for the productive citizen of the 21st century.

In order to better understand the concept of digital literacy we must mention that the idea in itself, the “specialized literacy” related to a field that becomes very present in people’s lives at a certain historic moment, is not new. By reviewing the historical information, we can see in Table 1 (below) different characteristics underpinned within a “specialized literacy” umbrella.

<i>Specialized literacy concept</i>	<i>Coverage of the concept</i>
Literacy	It is the traditional, basic, understanding of the term and it covers one’s ability to read and write.
Mathematical literacy	It is the second oldest understanding of the term, relating to one’s ability to understand/solve/make use of basic algebra and mathematical analysis elements, equations, logics, data analysis.
Financial Literacy	It relates to one’s ability to understand basic and medium level financial operations, to create/maintain a basic budgetary structure, to understand the investment/capital concepts.
Cultural Literacy	It is one the modern forms of literacy, covering the ability of an individual to see/understand further than basic literacy level. It means one can understand and from a text more than it meets the eye, being able to make connections with other elements, put information into different contexts, understand rules of etiquette and place a set of information within correct/different historical setups.
Healthcare Literacy	It covers the ability of an individual to understand health consequences and basic medication, to effectively communicate relevant information about a health

	situation (symptoms, background information etc.), to understand and be able to use the local healthcare environment.
Mass-media Literacy	It is the newest form of “specialization” for the public, being in fact quite difficult to master – especially in front of the huge amounts of information available in today’s media. It relates to the ability of evaluating the information published in different media channels, as well as to the ability of understanding the inner workings of the current media industry.

Table 1. Specialized Literacy Concepts

The digital literacy factor is not directly linked to field of work or age. Of course, there is an indirect relation between those elements, but it mostly relates to the skills one has or aims to master during the current times, skills related to the digital tools at his disposal. From the literature review we can point out a series of such elements which are present in the majority of the cases when talking about digital literacy:

- The ability to make use of different devices, with different OS⁶s (e.g., Windows, MacOS, iOS, Android, Linux flavors etc.).
- The ability to use the most widespread online platforms.
- A general understanding of the current digital environment as a whole (basic concepts, basic security issues etc.).
- The capability to make use of technology in order to solve real problems.
- The capability to research and identify relevant information by making use of the extensive media categories at one’s disposal today (mostly online access).
- The capability to apply critical thinking for evaluation of digital information.
- The ability to recognize and mitigate (at least) basic digital threats today.
- The use of digital tools at one’s disposal by taking into account the safety and ethical issues.
- The ability to create new information and disseminate it with effectiveness throughout the entire online environment.

⁶ OS – operating system, the software that manages the device’s hardware and software resources.

3. Relevant views in the field of digital literacy

One of the most complete, even holistic, approaches in the area of digital literacy concepts is the one introduced by Doug Belshaw [2]. According to him, there are eight elements comprised within his understanding of the digital literacy term. The synthesis of his research in the field brought the following pattern elements for covering the definition of the term:

- Cultural
- Cognitive
- Constructive
- Communicative
- Confidence
- Creative
- Critical
- Civic

Synthesizing the description of each element in Belshaw's view can be found below:

- Cultural - it provides guideline elements for behavior in the online environment; it covers both the respect for network etiquette as well as online privacy protection elements.
- Cognitive - it provides the body of knowledge in the field, it relates to one's ability to make use of technology efficiently and also recognizing today's common digital tools, platforms, and capabilities.
- Constructive - it relates to one's understanding on how to effectively reuse electronic materials abiding by the relevant laws and regulations (copyright, public usage etc.).
- Communicative - the element covers the regulations and guidelines of online communication and the reasonable expectations from different publishing/social-media tools.
- Confidence - it comprises the knowledge related to the belonging to a community (online/electronic one) and understanding of the differences between real-life and online communities.
- Creative - covers the ability to create new and innovative content under the rules and regulations of a digital environment.
- Critical – it comprises the necessary skills one should have in order to be able to analyze and evaluate digital information and its context, by making use of different other means of information verification.

- Civic – it represents the understanding different digital environments with the view of being ready to become part of social manifestations started from/within the digital environment.

4. Results and Discussions

Based on the above-mentioned syntheses, we can easily argue for the really vast content that one would need to master in order to be considered “digitally literate” by all views and approaches.

Having quite an amount of data/information to process and master, and also because of the today’s reality of immersive digital environments being available to younger and younger people, we consider that the training for digital literacy should start from a very young age.

The children, in a vast majority percentage, are already exposed to the digital environment today. It would be an excellent idea for them to also start developing their “real” digital literacy skills in the same time. Having useful skills and requested abilities since childhood brings them a distinctive advantage over their peers, which were also immersed in the same digital environment but only for recreational, social-media and gaming activities.

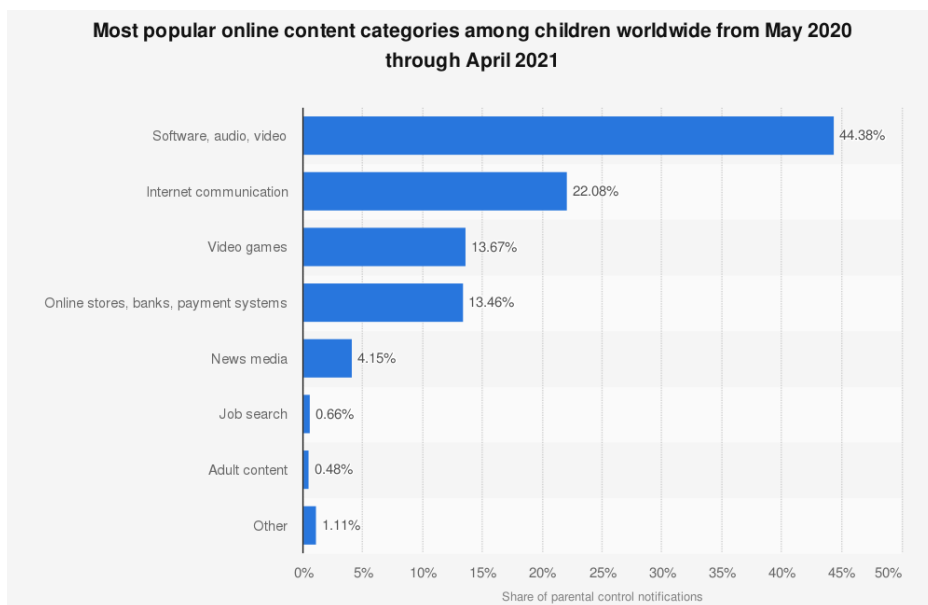


Fig.1 Most popular online content for children – May 2020 to April 2021⁷

⁷ Figure from Kaspersky Lab, Statista 2021

Correlating the above numbers with the fact that around 1 in 50 children navigating the digital environment is considered to become a victim of a cybercrime (identity theft, schemes, etc.), we can safely assume that there is a huge number of children at risk.

Cybercriminals are not only targeting high-stake actors, nations, world-wide spread multinationals, but also the average internet user – which would cover the children also.

The children can be taught, both by direct but also by indirect means, about basic cybersecurity skills. With proper guidance, they can quickly accumulate knowledge that would greatly benefit the entire society. First, because they will be better prepared and will grow up with an already capable set of abilities and skills, and secondly because they can be an important dissemination vector: both their colleagues/friends as well as their families might take advantage of their updated body of knowledge in the field.

As we can see below, in Fig.2, an ITU⁸ research [3] shows that the skills usually included in the “digital literacy” index can be at different levels for the same individual, with the safety values (defense against potential cybercrimes) among the lowest.

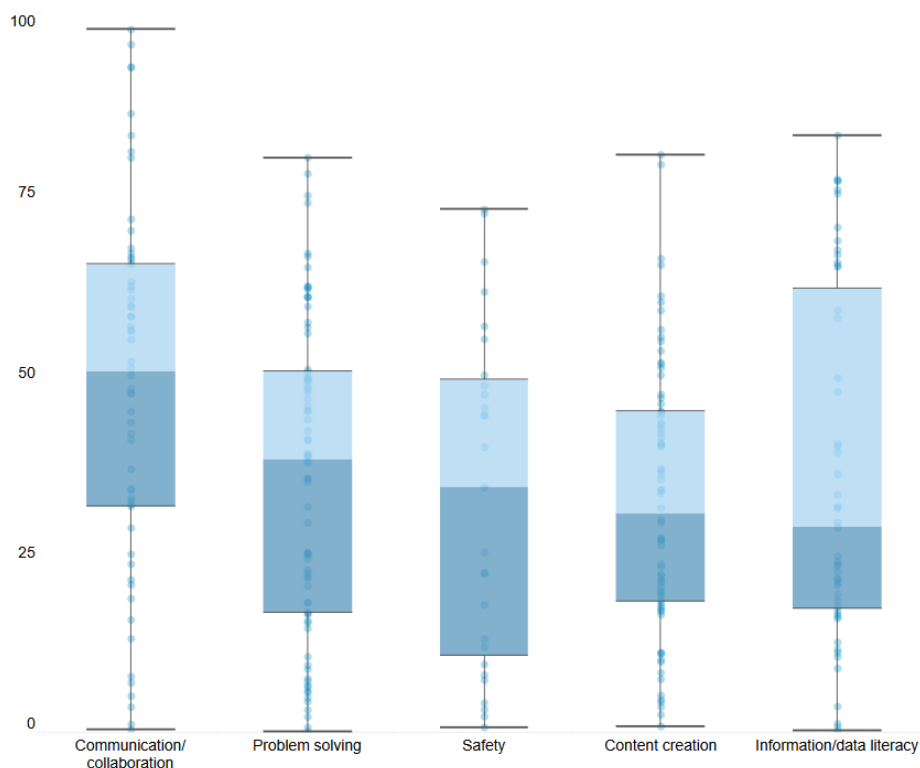


Fig. 2. Percentage of individuals with ICT skills by type of skill (2019-2021)⁹

⁸ ITU – International Telecommunication Union, www.itu.int

⁹ Source: https://www.itu.int/dms_pub/itu-d/opb/ind/d-ind-ict_mdd-2022-pdf-e.pdf, p.15

5. Conclusions and Recommendations

There is no exact path, 100% route to go, in order to reach a certain degree of digital literacy. As each individual is different, the type of knowledge involved in this aspect cannot be made to exactly fit everybody's needs. Taking into account these facts, we recommend a sustainable approach related to the digital literacy index increase. Such an approach would entail cooperative work from different perspectives – both private and public, family and education system, plus inner and societal motivation.

The first element which determines the index of digital literacy is public motivation. The level of digital literacy is not something attained mostly through formal training and schooling, but mainly by self-study, borrowing good practices, and practicing continuously. The general-public motivation towards increasing their literacy index in the field should mainly take into account the risk related to the digital environment. Among the most widely found risks for everyday user of the digital world we mention:

- Identity theft
- Cyberbullying
- Malware infestation
- Social engineering

Another important element to help increase the index of digital literacy is the governmental approach, their policies, and regulations. Cybersecurity, as part of digital literacy, needs legislative support. Of course, formal laws and regulations cannot always be updated with the latest technologies, as they advance at a very rapid pace. Nevertheless, communities require stable, dependable, and sustainable government policies for supporting digital literacy.

The educational system is another critical element for digital literacy [4]. Both formal and informal/vocational education systems could greatly benefit from teaching their students elements of cybersecurity first [5]. First levels school can also focus, with their younger body of students, on digital literacy as a whole, without technical elements. Higher level schools should focus more on the elements of digital literacy that would entail more technical knowledge.

An indirect but crucial element is represented by the labor market. As in many other cases, the labor market has a decisive role for guiding the development path of the individuals before actually comprising them. Young people prepare for what are the labor market requirements usually and a bigger emphasis of the employers' majority on a certain topic would greatly help that topic's expansion in the near and mid-term future. In case the labor market continues to focus on requesting or recompensating higher degrees of digital literacy (general public meaning), the young people and their guardians will emphasize acquiring skills in this specific area. The situation has greatly improved in this view after

the pandemic, as more and more employees were working from home - almost 100% based on digital equipment and tools, and the employing companies (the base of the labor market) understood that an increased level general knowledge related to the digital environment, especially regarding cybersecurity basics, would hugely benefit them directly. Such employees, with a higher level of digital literacy obtained previously to their current employment place, mean that the company can save a lot of resources that would have been otherwise required in order to bring them up-to-date with different requirements of the digital environment. A lot of money, time, skilled personnel, and trainers are required to cover this area in case the majority of the workforce is not digitally literate at an adequate level.

The overall conclusion is that the level of digital literacy, as sum of different ICT skills, is very directly correlated with the intrinsic level of cybersecurity that the digital environment users are able to expose, without specific training in the field. The higher the level of digital literacy, the higher the level of mass-protection against cybercrimes, thus the lower the spendings (in different units of measurement, not only strictly monetary) needed to mitigate and recover from cybercrimes (both at individual and employing companies' levels).

Acknowledgment

The research was carried out within the Computational Science and Machine Intelligence Research Center (CSMI) and the Center for Human Rights and Migration (CDOM).

References

- [1] Silvia Tăbușcă, 2010. "The Internet Access as a Fundamental Right" Romanian Economic Business Review, ISSN 1842-2497, vol. 4(2), pages 206-211.
- [2] Belshaw Doug, 2014. "The Essential Elements of Digital Literacies.", <http://digitalliteraci.es> (accessed March 21, 2023).
- [3] ITU, 2022. "Measuring digital development. Facts and Figures 2022", ISBN 978-92-61-37011-5, https://www.itu.int/dms_pub/itu-d/opb/ind/d-ind-ict_mdd-2022-pdf-e.pdf (accessed March 21, 2023)
- [4] Tăbușcă Alexandru, Garais Gabriel, Enăceanu Alexandru, 2022. "Cybersecurity Education – the New Literacy", Journal of Information Systems & Operations Management, ISSN 1843-4711, vol. 16.2 December 2022, pages 263-272.

[5] Tăbușcă Alexandru, Tăbușcă Silvia, 2022. "Basic Cyber Defence Education for Everyone", Journal of Information Systems & Operations Management, ISSN 1843-4711, vol. 16.1 May 2022, pp 253-263

Bibliography

Silvia Tăbușcă, 2010. "The Internet Access as a Fundamental Right" Romanian Economic Business Review, ISSN 1842-2497, vol. 4(2), pages 206-211.

Belshaw Doug, 2014. "The Essential Elements of Digital Literacies.", <http://digitalliteraci.es> (accessed March 21, 2023).

Mamedova Saida, Pawlowski Emily, Hudson Lisa, 2018. "A Description of U.S. Adults Who Are Not Digitally Literate", US Department of Education, NCES 2018-161, <https://nces.ed.gov/pubs2018/2018161.pdf> (accessed March 28, 2023)

UNICEF, 2018. "Digital Divide and Digital Literacy", <https://gdc.unicef.org/resource/digital-divide-and-digital-literacy> (accessed March 22, 2023)

Pritika Reddy, Bibhya Sharma, Kaylash Chaudhary, 2020. "Digital Literacy: A Review of Literature", International Journal of Technoethics (IJT), ISSN: 1947-3451, vol. 11(2), DOI: 10.4018/IJT.20200701.oa1

Flavin Briana, 2021. "What Is Digital Literacy? 5 Skills That Will Serve You Well". <https://www.rasmussen.edu/student-experience/college-life/what-is-digital-literacy/> (accessed March 28, 2023)

ITU, 2022. "Measuring digital development. Facts and Figures 2022", ISBN 978-92-61-37011-5, https://www.itu.int/dms_pub/itu-d/opb/ind/d-ind-ict_mdd-2022-pdf-e.pdf (accessed March 21, 2023)

Tăbușcă Alexandru, Tăbușcă Silvia, 2022. "Basic Cyber Defence Education for Everyone", Journal of Information Systems & Operations Management, ISSN 1843-4711, vol. 16.1 May 2022, pp 253-263

Tăbușcă Alexandru, Garais Gabriel, Enăceanu Alexandru, 2022. "Cybersecurity Education – the New Literacy", Journal of Information Systems & Operations Management, ISSN 1843-4711, vol. 16.2 December 2022, pages 263-272.

Ailoaiei Adina, 2022. "What Is Digital Literacy and Why It's Crucial to Us Now", Privacy Hub, https://www.cyberghostvpn.com/en_US/privacyhub/what-is-digital-literacy-and-why-its-crucial-to-us-now/ (accessed March 28, 2023)

- Nabanita De, 2022. “Taking The First Steps Towards Digital Literacy In 2022”, Forbes, <https://www.forbes.com/sites/forbeseq/2022/01/31/taking-the-first-steps-towards-digital-literacy-in-2022/> (accessed March 28, 2023)
- Bandura Romina, Mendez Leal Elena, 2022. “The Digital Literacy Imperative”, Center for Strategic and International Studies, <https://www.csis.org/analysis/digital-literacy-imperative> (accessed March 28, 2023)
- Schwartzbach Kevin, 2022. “Addressing Digital Literacy and Other Reasons for Non-Adoption of Broadband”, Rockefeller Institute of Government, <https://rockinst.org/blog/addressing-digital-literacy-and-other-reasons-for-non-adoption-of-broadband/> (accessed March 28, 2023)
- US Department of Education, 2022. “Advancing Digital Equity for All: Community-Based Recommendations for Developing Effective Digital Equity Plans to Close the Digital Divide and Enable Technology-Empowered Learning”, https://tech.ed.gov/files/2022/09/DEER-Resource-Guide_FINAL.pdf (accessed March 28, 2023)