Digitainability—Digital Competences Post-COVID-19 for a Sustainable Society

Maria José Sá [1,*], **Ana Isabel Santos** [2], **Sandro Serpa** [3] and **Carlos Miguel Ferreira** [4]

1   CIPES—Centre for Research in Higher Education Policies, 4450-227 Matosinhos, Portugal
2   Interdisciplinary Centre for Childhood and Adolescence—NICA—Uac, Faculty of Social Sciences and Humanities, University of the Azores, 9500-321 Ponta Delgada, Portugal; ana.is.santos@uac.pt
3   Interdisciplinary Centre of Social Sciences—CICS.UAc/CICS.NOVA.UAc, Interdisciplinary Centre for Childhood and Adolescence—NICA—Uac, Department of Sociology, Faculty of Social and Human Sciences, University of the Azores, 9500-321 Ponta Delgada, Portugal; sandro.nf.serpa@uac.pt
4   Interdisciplinary Centre of Social Sciences—CICS.NOVA, Estoril Higher Institute for Tourism and Hotel Studies, 2769-510 Estoril, Portugal; carlos.ferreira@eshte.pt
*   Correspondence: mjsa@cipes.up.pt

Abstract: The digitalization of societies, accelerated by the COVID-19 pandemic, is an unstoppable process. This paper seeks to answer the question: what post-COVID-19 digital competences are needed for a sustainable society? It also aims to analyze the digitalization processes in education for shaping a sustainable digital society. A bibliographic search was performed on some of the most relevant international databases of scientific literature and the selected documents were analyzed through a content analysis. It is concluded that digital education has experienced a strong increase, reinforced by COVID-19, shaping the digital presence in all dimensions of life. However, it is not sufficient to assume that the new generations are naturally engaged in and can master digital social sustainability. The results demonstrate the importance of literacy and the unavoidable promotion of sustainability in a digital society. However, this digitalization of the educational process poses several challenges: it requires both software and hardware conditions, as well as digital literacy as a result of a complex of literacies. It also implies that teachers and students change their standpoints and practices with the attainment of new teaching and learning competences in order to fight the digital divide and to foster the widest possible social inclusion for the promotion of sustainable society—digitainability.

Keywords: digitainability; COVID-19; digital competences; digital society; digital sustainability society; sustainability development; coronavirus; social inclusion; digital education

1. Introduction

We live in a world increasingly immersed in the digital, with the Internet, global communications and digital networks [1–3], in what may be called a digital society [4–7]. The digital, in the form of technologies, is already present in multiple dimensions of our daily life, with specificities that shape social relationships [7–10]. The digital society is here already [11,12]. An example is the so-called Society 5.0, which consists of an application of the digital society with Japanese logic with a very strong political dimension [5,13]. We live in societies in which digitalization processes are present everywhere, which is translated, for example, into a large number of individuals becoming interconnected in the virtual online world of the Internet through social networks and the research of information of any type. These processes tend to increasingly shape the knowledge we attain in its various modalities [14–18].

The COVID-19 pandemic, caused by the Severe Acute Respiratory Syndrome Coronavirus Type 2 (SARS-CoV-2), has caused major impacts worldwide [19–32]. It remains to be seen whether these changes are temporary or lasting, taking shape in a new normal [31,33].

This can even be considered the world's first digital age pandemic [26,34–38]. Among its varied impacts, COVID-19 has accelerated digital transformation in a more or less supported way [21,26,39–49].

However, in this context of digital change, COVID-19 has also amplified previously existing inequalities [21,26,44,50]. As Raffaghelli [50] (p. 3) states,

> The COVID-19 crisis brought to the fore this situation: while middle class, knowledge workers and citizens protected themselves by adopting rapidly all digital facilities, the poorest remained even more excluded from basic services such as education due to the lack of technological infrastructures (devices and connection) or the lack of skills to deal with the several forms of connectivity imposed by the pandemic (such as home-schooling).

This pandemic shaped and added to the already ongoing implementation of the digitalization of society [29,51–58] and education [59–64]. According to Blume [65] (p. 880),

> While the emergence of COVID-19 disrupted all facets of daily life around the world, education was one of the sectors most severely affected by the sudden imperative to move teaching and learning from primarily face-to-face interactions to distanced structures. Within weeks, and with little public discussion, digitally supported teaching and learning at primary, secondary, and tertiary levels was established in many countries. Beyond this initial impulse, however, there have been few pedagogical, philosophical, or organizational consistencies in how this shift has transpired, both internationally and at a national or even local level.

The digital is shaping, with increasing intensity and speed, social change, with profound consequences in terms of sustainability in society and industry, with its advantages and limitations [66–72].

In this context, the ability to exhibit digital competences or digital literacy is critical, as competences for conscious and intentional participation, not only in consumption but also in digital production in the most diverse areas of life [6,73,74], creating digital citizens [55,59,63]. A clear example is the existence of the "infodemic" in relation to the excess of (mis)information on COVID-19 itself [41,75–77].

This text, based on the assumption that COVID-19 is shaping a more digital society, focuses on the digital competences that will be necessary to build a sustainable digital society in the development of digitainability (digitalization + sustainability) [78], given that digital literacy is pivotal for individuals to be effective and efficient, both personally and professionally in this technology-dominated century [79,80]. To fulfil this aim, there is a need to analyze the digitalization processes in education and schooling, i.e., "the what, the how and the why" of learning and teaching [18] (p. 252) or, also, "what we access, how we access it, what we do with it, and who then accesses what we have done, are important elements of a postdigital world" [16] (p. 285), which implies a profound change in school culture at its various levels and dimensions.

In this context of digital culture characterized by participation, digitalization and the re-use of information [81], the question arises of how to foster learning through the schooling process, which is itself often conservative and based on the oral and written transmission of the teacher to a wide range of students. This urgent need and—we dare say—the inevitability of the digitalization of education/schooling is one of the biggest challenges that both the school as a social institution and society itself must face and address successfully in the promotion of a competence learning process centered on the student's active involvement [81].

How to prepare citizens to provide positive responses, both individually and collectively, to this new target motivated by a context in which online technology is always present [82], in a world of increasing change and complexity [83]? Training for competences as abilities to respond to the needs found, in terms of both specific competences (of a more technical and localized nature) [84] and transversal competences (such as autonomy, responsibility, social interaction, personal and professional development, leadership,

communication, problem-solving, teamwork and creativity) [85], has to be redesigned in this context [85–87].

While being critical, it is not enough to invest in technological structures to succeed in addressing this digital challenge of the learning and development of these (specific and transversal) competences [88]. Digital literacy is paramount in this process [6,85]. In this process, and perhaps with increasing relevance, the domain—at least in the logic of the cybersecurity users—is yet another critical digital competence.

Hence, the digitalization of societies and the consequent digitalization of the educational process, with the potential access of each person to a whole array of information [89,90]—no longer owned, necessarily and solely by the teacher—is an unstoppable process with a deep influence on all dimensions of social and economic life.

2. Materials and Methods

This study took on a qualitative dimension, and the research technique used was content analysis. The collection of relevant literature took place by mobilizing the B-ON and SCILIT databases from 1 to 10 May 2021 by searching for manuscripts with the expression "digital education" and "sustainability" in the title and/or abstract. The B-ON (Online Knowledge Library) database incorporates the Web of Knowledge, SciELO and DOAJ databases, among others [91]. The SCILIT database covers all documentation to which a DOI (Digital Object Identifier) has been assigned [92]. After collecting the documents (articles, books and book chapters) and assessing their relevance to the discussion of the topic under analysis, the authors selected 209 documents. Table 1 depicts the documents analyzed and their characteristics.

Table 1. Document sources analyzed and their characterization.

Type of Document					Geographical Scope		Year of Publication			
Theoretical/ Conceptual	Empirical	Opinion/ Viewpoint Article	Report	Book Review	International	National	2021	2020	2019	Prior to 2019
136	62	7	2	2	157	52	25	124	21	39
Total: 209 publications										

Source: Authors' production.

For the treatment of the collected data, the authors used the content analysis technique. According to Krippendorff [93], this technique enables the compression of a large number of words and text into a smaller number of content categories based on explicit processing rules.

In terms of the data coding strategy adopted, the documents used in this study were analyzed as a text unit to code. In this study, a set of coded categories was constructed a priori, based on a first reading of the selected documents. Yet this categorization, made before the analysis of documents, was not a closed system. The analysis of the reported data allowed emerging categories to be established, that is, categories that were integrated into the categorical system as the data analysis developed.

Thus, the process of coding the collected data began when the first documents were analyzed in the pre-coding stage; the codes were, in a second stage (or first coding cycle), refined and organized into one major category and five subcategories through a more in-depth analysis of the data; and, finally (in the second coding cycle), compared with each other and consolidated, in the sense of a progression towards the establishment of themes, which, in turn, led to the emergence of theoretical constructs.

3. Digital Competences Post-COVID-19 for a Sustainable Society

How to foster quality digital education in a digital society? A basic idea is the need to shape, in a digital environment, communication between all participants that is not limited

to the sheer transmission of information from the teacher to the student [94], and for which human-to-human empathy, in this digital medium, is pivotal [88].

3.1. Digital Society

One of the emerging concepts of digital society is the concept of Society 5.0 [5,95], as a super-intelligent or smart society that promotes sustainable social development, mobilizing the potential of the relationship of individual–cyber–digital technology [96,97].

Digital society is all around us, and we are, to some extent, immersed in and by it, with implications for educational processes [98]. However, it is not possible to have an unrealistic discourse that does not take into account that there is no digital literacy if the digital divides, both in the access, consumption and production of digital forms, are not addressed upstream. These digital divides are highly dependent on economic, social, cultural, gender and age inequalities, among other factors [60].

We thus live in an increasingly digitalized world [99] in a digital society with an increasing digital interaction, both among people and between each person with technology [42]. As Choi [100] (p. 2) states,

> "The information technology (IT) revolution technically connected everything in the world. As a result, the technical conditions of building a digital ecosystem were also secured. This is the dot-com business model". However, the author warns of the danger that "just because everything is technically connected does not mean people are automatically connected". [100] (p. 2)

3.2. Digital Literacy and Inclusion

On the concept of digital literacy [48,79,101], Martin [102] (p. 155) offers the following definition and explanation:

> Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process.

It follows from this definition that digital literacy is crucial for the harmonious participation of individuals, empowering them in their life in society as consumers but also as creators of digital technology in a conscious, critical and intentional way, which is also vital for sustainable development [50,74,103–105].

However, the digital divide exists in the differences in access and use (consumption and production) of the digital and is deeply linked to the cultural, economic and social conditions of individuals, as well as their gender and age [79,106–108], which hinders sustainable development [21,104] in a post-COVID-19 context [103,109]. For example, the "COVID-19 Infodemic" with fake news focusing on COVID-19 [35,36,110] created situations of misinformation that science communication found difficult to clarify [111–117].

Today's societies, to a lesser or greater extent depending on their level of development, are dominated by digital technology. For citizens to be able to move in this highly complex world, they need to have the so-called digital literacy, which, in turn, is the result of a complex of literacies and, consequently, the boundaries between "cyberspace" and "real life". According to Fussey and Roth [8] (p. 660),

> Digital forms of interaction are embedded in everyday life and every sector of society. Whereas early analyses separated 'cyberspace' from 'real' life, it is now recognized that the ubiquity of digital technology and the growing inseparability of online and offline interactions renders this bifurcation obsolete (if ever adequate).

However, digital technologies are not "neutral objects". The access to them, the quantity and quality of information individuals have access to and the capacity to produce content varies according to social class, age level, gender, culture and other personal features. These differences can lead to inequalities in a certain social reproduction [7,9] and unequal power relationships [7,118]. Nascimento [9] (p. 672) argues that although the massification of digital social networks and the access to information have underlying forms of democratic participation and freedom of expression, they entail the danger of "reproducing or even exacerbating forms of discrimination and attempts to silence socially discriminated groups".

This difference between digital inclusion [119] and the digital divide [3,120] may even create a new elite of Digital Suzerains [71]. Lupton [7], mobilizing van Dijk and Hacker [121] (pp. 123–124), identified four types of barriers in the access to digital technologies:

- lack of elementary digital experience caused by a low interest or anxiety about using the technologies or design elements of the technologies that discourage use;
- lack of access to the technologies, such as not owning a digital device or not having a connection to the internet;
- lack of digital skills due to low levels of use or unfamiliarity with new versions of technologies;
- lack of significant usage opportunities due to time constraints and competition over access in the domestic or workplace setting.

Of these four types of barriers to the access and use of digital technologies, the fact that potential users lack access to the technologies themselves and the competences/literacy needed to use them effectively is particularly relevant.

The digital world is still made up of social artefacts [7] that are socially produced [122,123]. According to Selwyn, Nemorin, Bulfin, and Johnson [124] (p. 3), "When we talk about digital technology, we are often referring to the activities and practices that people do in tandem with technology, rather than the technologies themselves". As an example, the emotional investment made in the use of technology is directly proportional to the high degree of ignorance of a large proportion of individuals about the functioning of technologies [1].

Koppel and Langer [125], following Reder [126], propose that to succeed, the road to digital inclusion should consist of four pivotal stages:

1. Digital access, as a significant part of the world's population has never had access to or contact with digital technologies;
2. Digital taste, which aims to help individuals identify how they can benefit from the digital world, i.e., the individuals define their personal goals when using digital equipment and networks;
3. Digital readiness, i.e., a good part of the population is not yet equipped with the basic competences needed to interact with the digital world and, therefore, they are not yet "ready" to make full use of technology;
4. Digital literacy, which is a process of permanent development of the individuals' capacities and competences that allow them to be prepared for the digital world with full awareness and intention.

Hence, digital literacy is a central concept in the process of dealing with/using/mobilizing digital competences in a world with increasing possibilities of obtaining information but also of manipulation [2,71,74,79,119,120,125,127–131]. Digital literacy could then be understood as "[. . .] a competence to mobilize both as a consumer and as a producer to enable good performance and functional participation in a digital context" [71] (p. 19).

Spires [132] (p. 1) argues that "digital literacies exist within sociocultural contexts that give them shape and definition". For the author, the analysis of the information circulating on the Internet—in terms of credibility and reliability—is critical, given that any individual/entity can publish on the Internet without any scrutiny. On the other hand, there are social advantages and drawbacks in terms of access to and use of digital technologies and information in the global society. This production and consumption of digital information

is imbued with socially constructed concepts such as power, inequality and injustice in human relationships, which need to be understood. Spires [132] (p. 2) further posits that "Above all, human agency is at the core of what it means to be digitally literate".

The model of basic digital literacy offered by Koppel and Langer [125] and depicted in Figure 1 can be a synthesis of what the notion of digital literacy entails.
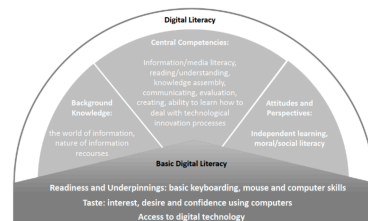
Figure 1. Model of basic digital literacy. Source: Koppel and Langer [125] (p. 341).

The authors distinguish between basic digital literacy, which encompasses basic ICT competences, and digital literacy, which requires a higher level of competences in digital technologies and an attitude of independent learning on the part of the users.

Reddy, Sharma and Chaudhary [133] (p. 83) defined digital literacy as "[. . .] an individual's ability to find and evaluate information, use this information effectively, create new content using this information and share and communicate this newly created information using appropriate digital technologies". According to the authors, for individuals to be considered as having digital literacy, they must:

- Know how to use digital technologies effectively and efficiently;
- Demonstrate technical and cognitive competences that enable them to carry out research based on digital media, and to assess the quality and truthfulness of the information they collect;
- Be familiar with the relationship between technology and their personal life, and know how to properly interact with other individuals through digital technologies;
- Participate actively in the life of civil society, namely through seeking and sharing information, learning or improving technical and transversal competences, and overall human development;
- Weigh carefully the scope and impact of digital information on others and on society at large [133].

The results of the research developed allow it to be concluded that digital literacy is transversal, complex and socio-culturally sensitive. Koppel and Langer [125], following the European Literacy Policy Network, offer a pertinent synthesis of what digital literacy is and the role it plays in the lives of individuals:

Digital Literacy is part of everyday literacy: that is to say, it can be viewed as both similar to and different from traditional literacy. To read and write digitally, students and teachers must learn to create and interpret texts in diverse modes (such as static and moving images and icons, spoken and written language, screen layout etc.), and to navigate texts across diverse digital platforms which offer a variety of learning opportunities, formats for creation, and spaces for expression that were not previously available. [125] (pp. 337 and 338, according to the European Literacy Policy Network)

Given the above, it is concluded that digital literacy is, and can only be, the result of a complex process of various literacies [134], which start from literacy as a set of written information processing competences in everyday life. These competences include reading, writing and mathematics, applied to various written materials (texts, documents, graphs, figures), normally used in everyday social, professional and personal life [135].

In a very pertinent way, Reddy et al. [133] (p. 84) put forth the following types of literacy as digital competences that translate digital literacy:

1. Information Literacy: Using digital technology to find, locate, analyze and synthesize resources, evaluating the credibility of these resources [. . .] and formulating research questions in an accurate, effective and efficient manner;
2. Computer Literacy: An understanding of how to use computers, digital technologies and their applications for practical use;
3. Media Literacy: Having the ability to use digital technologies to access, analyze, evaluate and communicate the information on a variety of digital platforms;
4. Communication Literacy: Using digital technologies to communicate effectively as individuals and work collaboratively in groups, using publishing technologies, the Internet and Web 2.0 tools and technologies;
5. Visual Literacy: Having the ability to use digital technology to "read", interpret and understand information presented in pictorial or graphic images and communicate this information and convert the information into visual representations;
6. Technological Literacy: Having the ability to use digital technology to improve learning, productivity and performance.

For all the above reasons, an interdisciplinary effort is needed to promote digital literacy [71,118,136].

The COVID-19 pandemic has become a further element that is shaping the presence of the digital in various dimensions of daily life, such as the social, economic, political and even personal dimensions [25,32,63,79,131]. However, it is not sufficient to assume that the new generations are naturally embedded in, are familiar with and can master the digital. Likewise, it is also a mistake to consider that having or receiving technology will motivate, *per se*, a growing presence in the digital world. In this regard, McGinty [137] (p. 68) argues that

> If we can encourage older adults to teach each other, they could receive more peer-based social support, increasing digital literacy diffusion. The impact of the additional social isolation created by COVID-19 has increased the need for programs designed to empower older adults in using technology as part of their daily lives.

In conclusion, digital literacy is the result of a complex of literacies, with the consequences that this entails. At the same time, digital literacy can generate divisive digital processes that must be tackled to achieve the broadest possible social inclusion, which always implies, ultimately, critical literacy [134].

3.3. Digitainability

Digital competences are crucial for managing all the knowledge around us [99,138–140] in this new digital context [41,45,46,105,141].

Among the numerous competences individuals must have to move effectively in this digital world, there are the hard skills (which are directly associated with the performance of specific activities) and the soft skills [85], which include communication skills, self-motivation and willingness to learn [63,142], among several others and which are essential for the development of sustainability [21,143]. Sá and Serpa [60] (p. 4525) refer to the benefits of digitalization for sustainable development as unavoidable, stressing that "[. . .] only those countries and systems that fully embrace an education that fosters digital competences will equip their citizens with the competences needed for them to thrive and succeed both in the personal and professional spheres".

This whole new context entails the attainment of new competences related to the digital [27,40,104,139,144,145]. Fonseca and Picoto [46] (p. 54) emphasize the following as core competences in the context of digitalization:

> (1) evaluating data, information and digital content; (2) browsing, searching, filtering data, information and digital content; (3) interacting through digital technologies; (4) managing data, information and digital content; and (5) collaborating through digital technologies.

For their part, van Laar et al. [106] refer to the following set of 21st century digital competences: information, communication, collaboration, critical thinking, creativity and problem-solving.

In a summary, Table 2 depicts the key competences for sustainability, according to the vision of UNESCO [146].

Table 2. Key competences for sustainability.

Systems thinking competence: the ability to recognize and understand relationships; to analyze complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty.
Anticipatory competence: the ability to understand and evaluate multiple futures–possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes.
Normative competence: the ability to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions.
Strategic competence: the ability to collectively develop and implement innovative actions that further sustainability at the local level and further afield.
Collaboration competence: the ability to learn from others; to understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving.
Critical thinking competence: the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse.
Self-awareness competence: the ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires.
Integrated problem-solving competence: the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the abovementioned competences.

Source: UNESCO [146] (p. 10).

This learning of competences for a sustainable digital society–digitainability–implies new pedagogical dynamics and methodologies, both in the face-to-face context of the learning and teaching process and in the distance learning modality [19,27,42,147–149], in its variants of blended learning, flipped classroom, inquiry–participatory and smart teaching [6,24,148,150–155]. These variants have, in their differences, the common element of fostering the dynamics of learning through (controlled) learner autonomy, with greater personalization in fostering students' self-learning [21,25,27,60,69,70,79,85,86,103,105,107,134,138,139,149,154–161].

These pedagogical dynamics, which confront an overly transmissive school culture, happen and will happen increasingly through the digital and must be, simultaneously, framed by the digital and the framers of that same digital [20,25,44,48,49,103–107,150,162–164].

These digitainability learning processes take place in a context of social, economic and even cultural transformations caused by the COVID-19 pandemic [25,105,139,147,151–153,165,166]. Regarding the changes that COVID-19 has caused in education and, specifically, in the learning and teaching process, the author of [167] (p. ix) states that the pandemic has caused "[. . .] a surge in online learning at all levels of education as well as a way of continuing to provide training. This is the time to learn from global good practices and build evidence to transform teaching and learning. This disruptive change has brought about a paradigm shift in the ways in which individuals, societies, and governments think and prepare in response to the rapidly changing world of work".

3.4. Digitainability Learning Processes

The current society, or rather, the current societies are increasingly articulated through the digital dimension in the production of material goods and services, with Industry 4.0 based on an articulated mobilization between the physical and virtual dimensions that takes shape in a smart factory [5,168], but also in social reproduction and the interactions between individuals in the Digital Society [169–171]. An example is Society 5.0 through the mobilization of the articulated potential between cyber–physical–social that can be materialized in a super-smart society [5,172,173].

However, not all of us are "Homo Interneticus" [174], which causes a digital divide in these processes of the digitalization of societies [51,59,172,175–177] because digital inclusion technology is not neutral [178]:

> These inequalities are transversal to any society and cause the divide of citizens in terms of gender, age, professional status, individuals with and without disabilities, socio-economic status, social class and cultural capital, among several other variables. Thus, this type of discrimination that leads to a digital divide is, in addition to the already traditional forms of discrimination, causing its aggravation and the widening of the gap between individuals with different features. [173] (p. 7).

In this process, learning development by all stakeholders is critical, with the acknowledgement that education is more than schooling [86], transcending the transmission-based school culture [31,55,61,179,180]:

> [. . .] the target groups of current times are (1) those who are already outside society and for whom a promise of digital inclusion is a promise of societal inclusion; (2) the non-user or rare-user who needs motivation in order to want to be digitally included, and finally (3) groups seen as not possessing the capacity to keep up with development (i.e., non-users), or seen as using digital technologies too much or too superficially (i.e., wrong-users) and therefore need to be corrected. These target groups can be seen as the digital losers of today. [181] (p. 113).

For example, as Rodrigues [61] (p. 31) indicates, addressing specifically an active teacher training model:

1.　it was possible to differentiate groups according to the needs and interests of the trainees and to carry out the work in an authentic social context;
2.　it was appropriate to plan learning scenarios using active methods, based on collaborative work, which allowed the social construction of students' own knowledge;
3.　diversified skills, namely digital, reflexive and self-regulation could be developed in teacher education;
4.　continuous evaluation supported by feedback could be developed;
5.　the isomorphic reproduction of skills for their students, particularly technology skills, was observed in the classes taught by the master's students in the cooperating schools.

The promotion of digital competences in education is not limited to the school, despite the fact that it is the vital element to intentionally foster digital competences for digital citizenship [74]. According to Sá and Serpa [60] (p. 4521), "The need for digital competences is central to shaping the participation of individuals from different conditions in social, age, gender and even disability terms in this society", besides its pivotal role in the defense of citizens' rights and duties [182,183].

Only in this way will freedom be more protected, transforming the destructive understanding of freedom—freedom from—in for a positive understanding—freedom for [103,184]. In the same vein, Ostafiichuk [185] (p. 126) argues that:

> "The opportunities and risks of information technology affect and correlate with the fundamental values of freedom dignity and equality, as well as with specific human rights such as privacy or freedom of expression.

The content of basic digital human rights consists of: the right to access the electronic network the right to communicate and express one's opinion freely on the Internet the right to privacy".

There is a close interconnection between digitally included and educated digital citizens, social integration, information sharing and discussion and Sustainable Development Goals [6,69,70,85,134]. Lozano-Díaz and Fernández-Prados [186] advocate, in this respect, that "Educating today's digital citizens on sustainability means training them for justice and social activism, commitment and political engagement" (p. 1), for integral citizenship [181].

3.5. Digital Sustainability in a Critical Society

The COVID-19 pandemic seems to have contributed to the development of the implementation of a digital society as a super-smart society based on a merger between the real world and the virtual world, mobilizing Artificial Intelligence as a factor in the articulation of a sustainable social and economic potential development [5,25]. Digital sustainability is paramount in this process. Its main features are detailed in Table 3.

Table 3. Six characteristics of digital sustainability.

Intergenerational justice	Digital goods such as data, content and software must be made available in a way that their long-term usability is ensured.
Regenerative capacity	Information and communication technologies are subject to constant change; everyone must have the option to participate in the production, development and dissemination of digital goods.
Economic use of resources	Digital goods are not subject to economic rivalry; unrestricted technical and legal reuse and distribution of digital resources must be ensured.
Risk reduction	Digital goods should therefore be designed so that they do not create dependencies towards their manufacturers, are trustworthy and can be interpreted correctly by all users.
Absorptive capacity	Society must be able to absorb digital resources in order to be able to use and adapt them appropriately towards new needs and requirements.
Ecological and economic added value	Digital goods must be made freely available in order to be shared to the largest extent possible enabling the potential for innovation and the full value for society.

Source: Based on Stürmer [187] (p. 495).

Educational processes are crucial in fostering digital sustainability in a digital society [74,173,188], with active learning [85,103,189].

The school offers, thus, a critical contribution to social cohesion and social equity through digital inclusion in education for sustainable development. The benefits of digitalization for sustainable development are undeniable, and only those countries and systems that fully embrace an education that fosters digital competences will equip their citizens with the competences needed for them to thrive and succeed both in the personal and professional spheres. [60] (p. 4525)

However, the school is, in institutional terms, a conservative industry, which hampers its necessary transformation [14,98]; within a school culture, there are shared ways of thinking, feeling and acting that shape common expectations [190]. It is, in most cases, a traditionalist institution [86]. This hinders its active and, if possible, even guiding adaptation in preparing different generations for a world with many new features. As such, the school risks being overtaken. Following Soroka [98], digital education has several tools, which the author divides into three groups: tool software for creating e-learning materials;

platforms for posting materials (providing access to these materials) and accounting for education recipients; and platforms for the interaction of participants in the educational process (webinars, forums, chats, social networks).

One of the critical elements for this necessary transformation of the learning and teaching process is to acknowledge that there are diverse—and sometimes contrasting—levels of digital literacy, both for teachers and students [11,81,89,191]. These dissimilar levels may contradict the expectations of individuals depending on factors such as social status, curriculum alterations, material conditions, socio-economic context, gender, age, availability and the assessment that they make of the situation, among many other variables [74,192–194].

At the pedagogical level, in her epistemological approaches to digital learning in educational contexts, Daniela [193] considers that digitalization entails a profound transformation in the learning and teaching process and proposes a smart pedagogical process to operate in a technology-enhanced learning environment using digitalization capabilities. This process may be analyzed according to four knowledge perspectives: knowledge growth (enhanced learning outcomes); knowledge attainment (accessed in different ways); knowledge accrual (in various media); and knowledge access (can be freely accessed for use) (for further development, Daniela [193]). In this regard, Daniela [193] (p. 4) sustains that "[. . .] the most important outcome may not be the increase in knowledge, but rather a change in the way knowledge is acquired, accumulated, and used to understand how the technology world works and to pave the way for new advancements".

In a detailed manner, for Linda Daniela [193], the development of smart pedagogy is vital for the necessary updating of schooling. The author further offers the concept of smart pedagogy. According to Daniela [193], some principles of smart pedagogy include: learning anywhere, anytime; a fascination with new technologies; the availability of technology and software; the existence of online opportunities for transforming teaching materials; the development of new teaching materials and the assessment of their impact on learning outcomes; the process of learning analytics, which requires constant monitoring of the learning process; and learning design, i.e., the way the learning process is designed to include learning via online materials.

Palanivel [87] (p. 7) comments that a smart classroom is the high-quality shape of a digital classroom and a digitalized learning and teaching process. The author continues, characterizing smart education as "[. . .] a set of technology-based solutions that leverage Internet and other smart technologies combined with engineering excellence to enhance learning, affordable education and reachable to the target audience". Communication between the institutional actors in such a learning environment is possible with the utilization of digital technologies and tools, such as smartphones, tablets and wireless Internet connections, among others. The whole process is, according to the authors, all about smart technology, given that "The components of a smart education include smart classroom, smart teaching, smart learning, smart learning environments and smart campus" [87] (p. 7), among other components.

Spector [194] puts forth a framework for smart learning environments (SLEs), which entails their desirable characteristics. Thus, according to the author, SLEs should be necessary (effectiveness, efficiency, scalable); highly desirable (engaging, flexible, adaptive, personalized); and likely (conversational, reflective, innovative) [194].

This educational model involves three main actors that are the integrating parts of the learning and teaching process and that characterize smart education: teachers, students and technology [195].

The broadened use of digital technologies is turning education and the learning and teaching process into an even more intelligent and universal environment, provided that they are made available to the whole educational community. Furthermore, this new form of educating and being educated requires digital fluency and equity, which are two of the main challenges to face and to be overcome for a successful smart education [87]. The author offers a detailed scheme of the complex smart education architecture, which is

composed of three layers: the smart learning application layer (which encompasses the smart classroom, smart analysis, smart management, smart monitoring and tracking, smart analytics and users such as domain experts and end-users); the smart computing layer, which includes all the technological tools); and the smart campus layer (which provides support to the learning and teaching process as well as research, enhances service quality and facilitates unified decision-making) [87].

This is a fairly recent field of research and, thus, there are some challenges linked to smart education that need further study. According to Martín, Alario-Hoyos and Kloos [196], some of these challenges are linked to connectivity, with the possibility and speed of communication; security and privacy of data; prediction systems that enable the adoption of successful corrective measures for the success of the learning process; and efficiency in the data visualization of both teachers and students.

A smart education involves ascribing a more central role to the students and their participation in a process from "by one to many" into "by many to many" [81] (p. 11).

Digital education, of which smart education was exposed as an illustration, entails, on the part of the teacher—and in comparison with traditional education—flexibility in the short- and medium-term planning of the learning activities to develop [98] permanent coordination [90] and the implementation of active methods [191,197] in the promotion of active learning [14]. That is to say, following Domingo-Coscollola et al. [191], it is critical that the teacher has methodological digital competence.

4. Discussion and Conclusions

From the several challenges that emerge from the implementation of digital education, one of the most referred to is the likely work overload of both students and teachers [88,193].

Another challenge is the need to change both the organization's culture and leadership [11,89,190,198], motivating students that are overwhelmed by so many "temptations" [197]. There is also the need for a mental shift on the part of both teachers and students who need to leave their comfort zone [11,86] and change their expectations regarding the learning and teaching process [86,199].

The digital divide [200], which is visible in the inequalities of access, both in physical terms and at the digital literacy level, is also a profound challenge in the mobilization of digital resources [6,18,74,197,201]. In a very pertinent way, Garzón Artacho et al. [201] (p. 2) offer a summary of the competence areas that help the digital teaching competence to be attained: information and information literacy, communication and collaboration, digital content creation, security and problem-solving.

Rogerson [202] (p. 1) claims that, in the digital era, individuals are those who produce changes in relation to digital technology and also those who "use and abuse digital technology". The author further advocates that "The tension between use and abuse is where the ethical hotspots lie" [202] (p. 1).

Thus, it is critical to promote social responsibility, which, according to Rogerson [203], seeks to (1) foster a socially responsible culture in diverse contexts such as the home, work and society at large; (2) support the well-being of all individuals; (3) encompass the global common values but respect local cultural differences; (4) acknowledge that social responsibility is more than just abiding by the law; and (5) promote in individuals a behavior of proactivity when developing and using digital technology.

Moreover, the time spent in front of the screen may impair the individuals' health, causing the so-called Zoom fatigue [88], that is, the excessive amount of time spent on video calls and its effects on the human brain. Furthermore, face-to-face communication has very different features from those of online communication.

Humans communicate even when they are not talking. During a face-to-face conversation, the brain partially focuses on the words spoken, but it also picks up additional signals from dozens of non-verbal suggestions. The brain detects if someone is looking at us, if the other person moves away slightly, or if they are restless as we speak, and it also detects whether the other party inhales quickly in preparation to interrupt the conversation. These

signals help create an image of what is being transmitted and what is expected in terms of the listener's response. Humans have evolved as social animals, and the detection of these signals is a natural process for many of us, a process that requires little conscious effort to analyze and that may lay the foundation for emotional intimacy. However, in a video call, these ingrained skills are distorted and require constant and demanding attention that depends only on words. If a person is framed in the image only from the shoulders up, there is no possibility of unveiling hand gestures or other sorts of body language. Moreover, if the video quality is poor, it is not possible to deduce something from small facial expressions. For some individuals, this prolonged division of attention creates a disconcerting feeling of exhaustion, even though they produced nothing. The brain is overwhelmed by the excess of unknown stimuli while trying to concentrate to find non-verbal cues that it cannot find [204].

Considering all the above, the implementation of digital education may be more rhetorical than real. In addition, it raises ideological questions, as sustained by Vivitsou [205] (p. 117) on digitalization.

> Such configurations attribute a mythical fullness to the concept, in the sense that digitalisation goes beyond the limits of a property that needs to be developed so that society can successfully deal with contemporary challenges and advancements. In this way, digitalisation emerges as a new hegemony in education, with narratives that are more and less directly referential.

This paper sought to analyze what digital competences post-COVID-19 are necessary for the development and consolidation of a sustainable society and, more specifically, digitainability in a COVID-19 pandemic context. As Tsekeris and Mastrogeorgiou [26] (p. 9) argue, the profound changes that this pandemic has caused and will continue to cause in all aspects of individuals' lives (educational processes being a central aspect) mean that the world has to prepare for different futures, which will be fundamentally digital, and that a "postnormal condition" is emerging, whose fundamental characteristics are "[. . .] permanent disruption, ignorance and uncertainty (i.e., ignorance nurtures uncertainty)".

The importance of literacy in promoting sustainability in a digital society is unquestionable. It is also important in order for individuals to be critically informed [134]. Literacy in general, and digital literacy in particular, is a powerful tool to empower individuals and to equip them with competences that allow them to have a successful personal and professional life [206]. The authors argue that literacy can function in two different ways: "[. . .] reproduce existing social formation or [. . .] [be] a set of cultural practices that promotes democratic and emancipatory change" [206] (p. ix).

The transformations shaped by the digital are not always totally positive and/or predictable [66], and there is always the danger of digital alienation [73]. Furthermore,

> Without a better understanding of consumer use and behavior patterns related to digital technologies and applications, policy makers will struggle to create the right incentives and policies to ensure that digital technologies deliver on their environmental promise. [207] (p. 11)

As a way of fighting this possible, and we would even say, probable alienation, it seems essential to us to disseminate knowledge through interdisciplinarity [5,73,136,208,209].

To create digital citizens post-COVID-19, it is crucial that conscious, critical and intentional participation in society is (re)created concurrently with a digital (environmental, social and economic) sustainability [54,85]. Milenkova and Lendzhova [55] (p. 1) state in relation to this that

> [. . .] digital citizenship is a term that reflects the level of training and competence, in order to actively participate in social, professional, and civil life. Digital citizenship refers to awareness, as well as the ability of sifting out the fake news, and to be critical of social life and what is happening in general. Digital citizenship also means activity and to take a position towards specific events in the life trajectory.

"Digitize or die!" This is how Coeckelbergh [210] begins his fruitful commentary on the influence of the COVID-19 pandemic on social life. COVID-19 has changed the regular livelihoods of the population, as well as changing the field of education [88,211].

Although outside the scope of this article—but suggesting interesting avenues of reflection for fruitful future analyses, Jandrić and Hayes [16] suggest the potential for this digitalization of society to, potentially, translate into a critical and emancipatory pedagogy.

At this point, it seems rather pertinent to recall Ivan Illich's stance [212]. The author proposed a reformulation of schooling:

> A good educational system should have three purposes: it should provide all who want to learn with access to available resources at any time in their lives; empower all who want to share what they know to find those who want to learn it from them; and, finally, furnish all who want to present an issue to the public with the opportunity to make their challenge known. [212] (position 1365)

The results of the analysis that supports this piece of research allow it to be concluded that education in the digital form has experienced a strong increase, which has also been reinforced by the COVID-19 pandemic. Its strengthening and influence, both quantitative and qualitative, is unavoidable. However, it poses several challenges: it requires both software and hardware conditions, as well as—and most importantly—digital literacy. These requirements are not necessarily shared by all the actors involved in this process. It also implies that teachers and students change their standpoints and consequent practices of how to teach and learn, respectively, with the attainment of new teaching and learning competences. This may be, at least in the least developed regions, the most challenging component to achieve for the success of smart education in a digital society.

This paper also sought to analyze which post-COVID-19 digital competences are necessary for the development and consolidation of a sustainable society and, more specifically, digitainability in the COVID-19 pandemic context. The importance of literacy in promoting sustainability in a digital society is unquestionable. It is also important for people to become being critically informed [134]. Literacy in general, and digital literacy in particular, is a powerful tool to empower individuals and to equip them with competences that will allow them to have a successful personal and professional life [206]. The authors argue that literacy can function in two different ways: "[. . .] reproduce existing social formation or [. . .] [be] a set of cultural practices that promotes democratic and emancipatory change" [206] (p. ix).

All the above arguments result in the need, in post-COVID-19 scenarios, to carry out future studies that, in a more in-depth and well-founded way, may allow the understanding and implementation of strategies to9 improve digitainability (in a future more sustainable society). One of the topics calling for further in-depth analysis is the issue of old and new digital divides, both in the consumption and the production of digital material, which may apprehend factors of differentiation at the societal, organizational and interaction levels, both in access, practices of use and representations in relation to the digital that seek to minimize the digital divide. Another topic is related to the promotion of sustainability in a digital society by and for all its elements in an inclusive way in this future digital culture, for which certain specific and transversal competences are paramount and which will also add to an initial and continued education that may be more effective and efficient.

Author Contributions: M.J.S. and S.S. initiated the idea and delineated the manuscript, and, together with A.I.S. and C.M.F., wrote the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the University of the Azores, Interdisciplinary Centre of Social Sciences-CICS.UAc/CICS.NOVA.UAc, UID/SOC/04647/2020, with the financial support of FCT/MEC through national funds and when applicable co-financed by FEDER under the PT2020 Partnership Agreement.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Acknowledgments: The authors thank the Academic Editor and Reviewers for their comments and suggestions.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Nascimento, L.F. A sociologia digital: Um desafio para o século XXI [Digital sociology: A challenge for the 21st century]. *Sociologias* **2016**, *18*, 216–241. [CrossRef]
2. Bygstad, B.; Dulsrud, A. Digital Ecosystems as a Unit of Scientific Analysis. A Sociological Investigation. In Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, HI, USA, 7–10 January 2020; pp. 5685–5694. [CrossRef]
3. Selwyn, N.; Facer, K. The sociology of education and digital technology: Past, present and future. *Oxf. Rev. Educ.* **2014**, *40*, 482–496. [CrossRef]
4. Redshaw, T. What is digital society? Reflections on the aims and purpose of digital sociology. *Sociology* **2019**, *54*, 425–431. [CrossRef]
5. Ferreira, C.M.; Serpa, S. Society 5.0 and social development: Contributions to a discussion. *Manag. Organ. Stud.* **2018**, *5*, 26–31. [CrossRef]
6. Santos, A.I.; Serpa, S. Literacy: Promoting sustainability in a digital society. *J. Educ. Teach. Soc. Stud.* **2020**, *2*, 1–9. [CrossRef]
7. Lupton, D. *Digital Sociology*; Routledge: London, UK, 2015.
8. Fussey, P.; Roth, S. Digitizing sociology: Continuity and change in the internet era. *Sociology* **2020**, *54*, 659–674. [CrossRef]
9. Nascimento, L.F. Digital sociology of Deborah Lupton. *CRH Bookl.* **2015**, *28*, 671–673. [CrossRef]
10. Carrozza, C. Re-conceptualizing social research in the "digital era". Issues of scholarships, methods, and epistemologies. *Anál. Soc.* **2018**, *53*, 652–671. [CrossRef]
11. Yuan, C.; Wang, L.; Eagle, J. Empowering English language learners through digital literacies: Research, complexities, and implications. *Media Commun.* **2019**, *7*, 128. [CrossRef]
12. Oke, A.; Fernandes, F.A.P. Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th Industrial Revolution (4IR). *J. Open Innov. Technol. Mark. Complex.* **2020**, *6*, 31. [CrossRef]
13. Gladden, M.E. Who will be the members of Society 5.0? Towards an anthropology of technologically posthumanized future societies. *Soc. Sci.* **2019**, *8*, 148. [CrossRef]
14. Brink, H.; Packmohr, S.; Vogelsang, K. The Digitalization of Universities from a Students' Perspective. In Proceedings of the 6th International Conference on Higher Education Advances (HEAd'20), Universitat Politècnica de Valencia, València, Spain, 2–5 June 2020; pp. 967–974. [CrossRef]
15. Chmykhova, E.V. Social risks of e-learning in a digital society. *Digit. Sociol.* **2020**, *3*, 4–11. [CrossRef]
16. Jandrić, P.; Hayes, S. Postdigital we-learn. *Stud. Philos. Educ.* **2020**, *39*, 285–297. [CrossRef]
17. Volungevičienė, A.; Teresevičienė, M.; Ehlers, U.-D. When is open and online learning relevant for curriculum change in higher education? Digital and network society perspective. *Electron. J. e-Learn.* **2020**, *18*, 88–101. [CrossRef]
18. Krumsvik, R. The digital challenges of school and teacher education in Norway: Some urgent questions and the search for answers. *Educ. Inf. Technol.* **2006**, *11*, 239–256. [CrossRef]
19. Petretto, D.R.; Masala, I.; Masala, C. Special educational needs, distance learning, inclusion and COVID-19. *Educ. Sci.* **2020**, *10*, 154. [CrossRef]
20. Mhlanga, D.; Moloi, T. COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? *Educ. Sci.* **2020**, *10*, 180. [CrossRef]
21. Portillo, J.; Garay, U.; Tejada, E.; Bilbao, N. Self-perception of the digital competence of educators during the COVID-19 pandemic: A cross-analysis of different educational stages. *Sustainability* **2020**, *12*, 10128. [CrossRef]
22. Merino, M.D.; Oliver-Hernández, C.; Vallellano, M.D.; Mateo, I. Is it possible to find something positive in being confined due to COVID-19? Implications for well-being. *Int. J. Environ. Res. Public Health* **2020**, *17*, 9087. [CrossRef] [PubMed]
23. Gamage, K.A.A.; Pradeep, R.G.G.R.; Najdanovic-Visak, V.; Gunawardhana, N. Academic standards and quality assurance: The impact of COVID-19 on university degree programs. *Sustainability* **2020**, *12*, 10032. [CrossRef]
24. Izagirre-Olaizola, J.; Morandeira-Arca, J. Business management teaching-learning processes in times of pandemic: Flipped classroom at a distance. *Sustainability* **2020**, *12*, 10137. [CrossRef]
25. Sá, M.J.; Serpa, S. The global crisis brought about by SARS-CoV-2 and its impacts on education: An overview of the Portuguese panorama. *Sci. Insights Educ. Front.* **2020**, *5*, 525–530. [CrossRef]
26. Tsekeris, C.; Mastrogeorgiou, Y. Contextualising COVID-19 as a digital pandemic. *Homo Virtualis* **2020**, *3*, 1. [CrossRef]
27. Villa-Fernández, N.; Martín-Gutiérrez, A. Educación inclusiva y digital: Desafíos y propuestas a partir del COVID-19 [Inclusive and digital education: Challenges and proposals from COVID-19]. *Virtu@lmente* **2020**, *8*. [CrossRef]
28. Kassegn, A.; Endris, E. Review on socio-economic impacts of "triple threats" of COVID-19, desert locusts, and floods in East Africa: Evidence from Ethiopia. *Cogent Soc. Sci.* **2021**, *7*, 1885122. [CrossRef]
29. Ferreira, C.M.; Serpa, S. (Eds.) *COVID-19 and Social Sciences*; MDPI: Basel, Switzerland, 2021.
30. Serpa, S.; Ferreira, C.M. COVID-19 and stigmatisation processes. *J. Educ. Soc. Res.* **2021**, *11*, 5–9. [CrossRef]

31. Aarts, E.; Fleuren, H.; Sitskoorn, M.; Wilthagen, T. (Eds.) *The New Common*; Springer: Cham, Switzerland, 2021. [CrossRef]
32. Ferreira, C.M.; Sá, M.J.; Martins, J.G.; Serpa, S. The COVID-19 contagion-pandemic dyad: A view from social sciences. *Societies* **2020**, *10*, 77. [CrossRef]
33. Wendt, T. Organized futures. On the ambiguity of the digital absorption of uncertainty. *Front. Educ.* **2021**, *6*, 554336. [CrossRef]
34. Bragazzi, N.L. Digital technologies-enabled smart manufacturing and Industry 4.0 in the post-COVID-19 era: Lessons learnt from a pandemic. *Int. J. Environ. Res. Public Health* **2020**, *17*, 4785. [CrossRef]
35. Bârgăoanu, A.; Durach, F. The COVID-19 infodemic—An accelerated version of the new digital ecosystem. *Rom. J. Commun. Public Relat.* **2020**, *22*, 125. [CrossRef]
36. Catalán-Matamoros, D. La comunicación sobre la pandemia del COVID-19 en la era digital: Manipulación informativa, fake news y redes sociales [Communication on the COVID-19 pandemic in the digital age: Information manipulation, fake news and social networks]. *Rev. Esp. Comun. Salud* **2020**, S5–S8. [CrossRef]
37. Kaur, B.; Kaur, T.P. The scenario of digital education: Comparison between pre and post COVID-19. *Strad Res.* **2020**, *7*, 726–735. [CrossRef]
38. Kim, S.; Kim, S. The crisis of public health and infodemic: Analyzing belief structure of fake news about COVID-19 pandemic. *Sustainability* **2020**, *12*, 9904. [CrossRef]
39. Gabryelczyk, R. Has COVID-19 accelerated digital transformation? Initial lessons learned for public administrations. *Inf. Syst. Manag.* **2020**, *37*, 303–309. [CrossRef]
40. Kudyba, S. COVID-19 and the acceleration of digital transformation and the future of work. *Inf. Syst. Manag.* **2020**, *37*, 284–287. [CrossRef]
41. Hantrais, L.; Allin, P.; Kritikos, M.; Sogomonjan, M.; Anand, P.B.; Livingstone, S.; Williams, M.; Innes, M. Covid-19 and the digital revolution. *Contemp. Soc. Sci.* **2020**, 1–15. [CrossRef]
42. Schwarz, M.; Scherrer, A.; Hohmann, C.; Heiberg, J.; Brugger, A.; Nuñez-Jimenez, A. COVID-19 and the academy: It is time for going digital. *Energy Res. Soc. Sci.* **2020**, *68*, 101684. [CrossRef]
43. Beaunoyer, E.; Dupéré, S.; Guitton, M.J. COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Comput. Hum. Behav.* **2020**, *111*, 106424. [CrossRef] [PubMed]
44. Nguyen, M.H.; Gruber, J.; Fuchs, J.; Marler, W.; Hunsaker, A.; Hargittai, E. Changes in digital communication during the COVID-19 global pandemic: Implications for digital inequality and future research. *Soc. Media Soc.* **2020**, *6*, 205630512094825. [CrossRef]
45. Iida, J. Digital transformation vs COVID-19: The case of Japan. *Digit. Law J.* **2020**, *1*, 8–16. [CrossRef]
46. Fonseca, P.; Picoto, W.N. The competencies needed for digital transformation. *Online J. Appl. Knowl. Manag.* **2020**, *8*, 53–70. [CrossRef]
47. Mendonça, F.M.; Dantas, M.A.R. Covid-19: Where is the digital transformation, big data, artificial intelligence and data analytics? *Rev. Serv. Público* **2020**, *71*, 212–234. [CrossRef]
48. Godhe, A.-L. Digital literacies or digital competence: Conceptualizations in Nordic curricula. *Media Commun.* **2019**, *7*, 25–35. [CrossRef]
49. Falloon, G. From digital literacy to digital competence: The Teacher Digital Competency (TDC) framework. *Educ. Technol. Res. Dev.* **2020**, *68*, 2449–2472. [CrossRef]
50. Elisa Raffaghelli, J. Is data literacy a catalyst of social justice? A response from nine data literacy initiatives in higher education. *Educ. Sci.* **2020**, *10*, 233. [CrossRef]
51. Giansanti, D.; Veltro, G. The digital divide in the era of COVID-19: An investigation into an important obstacle to the access to the mhealth by the citizen. *Healthcare* **2021**, *9*, 371. [CrossRef] [PubMed]
52. Krasilnikova, P.; Lapshina, S. Digitalization of citizen participation in urban development management. In Proceedings of the SHS Web of Conferences, Proceedings of the 3rd International Scientific Conference on New Industrialization and Digitalization (NID 2020), Ekaterinburg, Russia, 12 December 2020; EDP Sciences: Roubaix, France, 2021; Volume 93, p. 05013. [CrossRef]
53. Mazurchenko, A.; Maršíková, K. Digitally-powered human resource management: Skills and roles in the digital era. *Acta Inform. Pragensia* **2019**, *8*, 72–87. [CrossRef]
54. Wut, T.M.; Lee, D.; Ip, W.M.; Lee, S.W. Digital sustainability in the organization: Scale development and validation. *Sustainability* **2021**, *13*, 3530. [CrossRef]
55. Milenkova, V.; Lendzhova, V. Digital citizenship and digital literacy in the conditions of social crisis. *Computers* **2021**, *10*, 40. [CrossRef]
56. Ricarte, E. A expansão do processo de digitalização durante a pandemia de COVID-19 [The expansion of the digitalisation process during the COVID-19 pandemic]. *Finisterra* **2020**, *55*, 53–60. [CrossRef]
57. Trischler, J.; Westman Trischler, J. Design for experience—A public service design approach in the age of digitalization. *Public Manag. Rev.* **2021**, 1–20. [CrossRef]
58. Edelmann, N.; Mergel, I. Co-production of digital public services in Austrian public administrations. *Adm. Sci.* **2021**, *11*, 22. [CrossRef]
59. Rodríguez-Moreno, J.; Ortiz-Colón, A.M.; Cordón-Pozo, E.; Agreda-Montoro, M. The influence of digital tools and social networks on the digital competence of university students during COVID-19 pandemic. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2835. [CrossRef]

60. Sá, M.J.; Serpa, S. COVID-19 and the promotion of digital competences in education. *Univers. J. Educ. Res.* **2020**, *8*, 4520–4528. [CrossRef]

61. Rodrigues, A.L. Digital technologies integration in teacher education: The active teacher training model. *J. e-Learn. Knowl. Soc.* **2020**, *16*, 24–33. [CrossRef]

62. Pereira, C.S.; Durão, N.; Fonseca, D.; Ferreira, M.J.; Moreira, F. An educational approach for present and future of digital transformation in Portuguese organizations. *Appl. Sci.* **2020**, *10*, 757. [CrossRef]

63. Nash, C. Report on digital literacy in academic meetings during the 2020 COVID-19 lockdown. *Challenges* **2020**, *11*, 20. [CrossRef]

64. Powell, L.; McGuigan, N. Teaching, virtually: A critical reflection. *Account. Res. J.* **2020**. [CrossRef]

65. Blume, C. German teachers' digital habitus and their pandemic pedagogy. *Postdigital Sci. Educ.* **2020**, *2*, 879–905. [CrossRef]

66. Feroz, A.K.; Zo, H.; Chiravuri, A. Digital transformation and environmental sustainability: A review and research agenda. *Sustainability* **2021**, *13*, 1530. [CrossRef]

67. Stuermer, M.; Abu-Tayeh, G.; Myrach, T. Digital sustainability: Basic conditions for sustainable digital artifacts and their ecosystems. *Sustain. Sci.* **2016**, *12*, 247–262. [CrossRef]

68. Rogetzer, P.; Nowak, T.; Jammernegg, W.; Wakolbinger, T. Impact of digitalization on sustainable supply chains. *Chancen Grenzen Nachhalt.* **2018**, 131–144. [CrossRef]

69. Serpa, S.; Sá, M.J. Sociology of education for a sustainable future. *Sustainability* **2019**, *11*, 1757. [CrossRef]

70. Serpa, S.; Sá, M.J. Exploring sociology of education in the promotion of sustainability literacy in higher education. *J. Soc. Sci. Res.* **2019**, *5*, 101–116. [CrossRef]

71. Serpa, S.; Ferreira, C.M. Sustainability and digital as challenges of sociology. *J. Educ. Soc. Res.* **2020**, *10*, 15–23. [CrossRef]

72. Roblek, V.; Meško, M.; Meško Štok, Z. Digital sustainability in the fourth industrial revolution. In Proceedings of the ENTRENOVA 2016, Rovinj, Croatia, 8–9 September 2016. [CrossRef]

73. Serpa, S. Alienation on social media. *Stud. Media Commun.* **2019**, *7*, 17–20. [CrossRef]

74. Santos, A.I.; Serpa, S. The importance of promoting digital literacy in higher education. *Int. J. Soc. Sci. Stud.* **2017**, *5*, 90–93. [CrossRef]

75. Restrepo-Palacio, S.; Cifuentes, Y.M.S. Diseño y validación de un instrumento de evaluación de la competencia digital en educación superior [Design and validation of an instrument for the evaluation of digital competency in higher education]. *Ens. Aval. Políticas Públicas Educ.* **2020**, *28*, 932–961. [CrossRef]

76. Patil, U.; Kostareva, U.; Hadley, M.; Manganello, J.A.; Okan, O.; Dadaczynski, K.; Massey, P.M.; Agner, J.; Sentell, T. Health literacy, digital health literacy, and COVID-19 pandemic attitudes and behaviors in U.S. college students: Implications for interventions. *Int. J. Environ. Res. Public Health* **2021**, *18*, 3301. [CrossRef] [PubMed]

77. Serpa, S.; Ferreira, C.M.; Sá, M.J.; Santos, A.I. COVID-19 and scientific literacy. *J. Educ. Soc. Res.* **2021**, *11*, 1. [CrossRef]

78. Gupta, S.; Motlagh, M.; Rhyner, J. The digitalization sustainability matrix: A participatory research tool for investigating digitainability. *Sustainability* **2020**, *1*, 9283. [CrossRef]

79. Tejedor, S.; Cervi, L.; Pérez-Escoda, A.; Jumbo, F.T. Digital literacy and higher education during COVID-19 lockdown: Spain, Italy, and Ecuador. *Publications* **2020**, *8*, 48. [CrossRef]

80. Lyu, K.; Chen, X.; Ko, T.; Kong, D.; Irina, L. Philosophical perspective on the digital economy. *Sci. Insights* **2021**, *36*, 244–248. [CrossRef]

81. Di Sia, P. Looking at the new digital school: Didactics 2.0 and school 2.0. *E-Methodol.* **2020**, *6*, 9–21. [CrossRef]

82. Rocha, P.C.D.S.; Jucá, S.C.S.; Silva, S.A.; Monteiro, A.D.O. Competências digitais na perspectiva da informação, conhecimento e aprendizagem [Digital competences from the perspective of information, knowledge and learning]. *Res. Soc. Dev.* **2019**, *8*, 42881241. [CrossRef]

83. Fan, G.; Popkewitz, T.S. Introduction: Education policy and reform in the changing world. In *Handbook of Education Policy Studies. Values, Governance, Globalization, and Methodology*; Fan, G., Popkewitz, T.S., Eds.; Springer: Singapore, 2020; Volume 1, pp. v–xx. [CrossRef]

84. Balcar, J.; Janickova, L.; Filipova, L. What general competencies are required from the Czech labour force? *Prague Econ. Pap.* **2014**, *2*, 250–265. Available online: https://ssrn.com/abstract=2488735 (accessed on 3 May 2021). [CrossRef]

85. Sá, M.J.; Serpa, S. Transversal competences: Their importance and learning processes by higher education students. *Educ. Sci.* **2018**, *8*, 126. [CrossRef]

86. Serpa, S.; Santos, A.I.; Ferreira, C.M. Contributions of Ivan Illich to education in a digital society. *Acad. J. Interdiscip. Stud.* **2020**, *9*, 23–30. [CrossRef]

87. Palanivel, K. Emerging technologies to smart education. *Int. J. Comput. Trends Technol.* **2020**, *68*, 5–16. Available online: https://www.ijcttjournal.org/archives/ijctt-v68i2p102 (accessed on 4 May 2021).

88. Shurukhina, T.N.; Berseneva, S.A.; Belov, A.N.; Maksimenko, S.I.; Belova, G.A. Russian education facing the digital challenge. In Proceedings of the International Scientific Conference "Digitalization of Education: History, Trends and Prospects" (DETP 2020), Yekaterinburg, Russia, 23–24 April 2020; pp. 748–751. [CrossRef]

89. Dinis Sousa, R.; Karimova, B.; Gorlov, S. Digitalization as a new direction in education sphere. *E3S Web Conf.* **2020**, *159*, 09014. [CrossRef]

90. Strokov, A.A. Digitalization of education: Problems and prospects. *Vestn. Minin Univ.* **2020**, *8*, 15. [CrossRef]

91.   Biblioteca Do Conhecimento Online. What is B-ON? Available online: https://www.b-on.pt/en/what-is-b-on/ (accessed on 1 May 2021).
92.   SCILIT. Available online: https://www.scilit.net/ (accessed on 1 May 2021).
93.   Krippendorff, K. *Content Analysis: An Introduction to Its Methodology*, 4th ed.; SAGE: Thousand Oaks, CA, USA, 2018.
94.   Belonovskaya, I.D.; Matvievskaya, E.G.; Saitbaeva, E.R.; Ksenofontova, A.N.; Usmanov, S.M.; Zatsepina, M.B.; Bakshaeva, E.V. Digital communication in educational process: Development trends and new opportunities. *Online J. Commun. Media Technol.* **2020**, *10*. [CrossRef]
95.   Ferreira, C.M.; Serpa, S. Society 5.0. Scholarly Community Encyclopedia. 2019. Available online: https://encyclopedia.pub/321 (accessed on 4 May 2021).
96.   Medina-Borja, A. Smart human-centered service systems of the future. In *Future Services & Societal Systems in Society 5.0.*; Center for Research and Development Strategy, Japan Science and Technology Agency: Tokyo, Japan, 2017; pp. 235–239. Available online: https://www.jst.go.jp/crds/pdf/en/CRDS-FY2016-WR-13.pdf (accessed on 5 May 2021).
97.   Belamghari, M. The fragmentation of identity formation in the age of glocalization. *SAGE Open* **2020**, *10*, 215824402093487. [CrossRef]
98.   Soroka, V. Digital education in the international pedagogical discourse. *Comp. Prof. Pedagog.* **2019**, *9*, 74–81. [CrossRef]
99.   OECD. *Strengthening the Governance of Skills Systems: Lessons from Six OECD Countries*; OECD Publishing: Paris, France, 2020. [CrossRef]
100. Choi, P.K. A need for co-evolution between technological innovations and social innovations. *J. Open Innov. Technol. Market. Complex.* **2020**, *6*, 54. [CrossRef]
101. Meyer, A.I.D.S.; Mont'Alverne, C.R.D.S.A. Competências e habilidades no letramento digital [Skills and competences in digital literacy]. *ID Line Rev. Psicol.* **2020**, *14*, 386–400. [CrossRef]
102. Martin, A. A European framework for digital literacy. *Nord. J. Digit. Lit.* **2006**, *2*, 151–161. [CrossRef]
103. Sá, M.J.; Serpa, S. The COVID-19 pandemic as an opportunity to foster the sustainable development of teaching in higher education. *Sustainability* **2020**, *12*, 8525. [CrossRef]
104. Nambiar, R. Coding as an essential skill in the twenty-first century. In *Anticipating and Preparing for Emerging Skills and Jobs. Education in the Asia-Pacific Region: Issues, Concerns and Prospects*; Panth, B., Maclean, R., Eds.; Springer: Singapore, 2020; pp. 237–243. [CrossRef]
105. Panth, B.; Maclean, R. (Eds.) Available online: https://www.adb.org/sites/default/files/publication/626036/adb-springer-emerging-skills-jobs.pdf (accessed on 2 May 2021).
106. Van Laar, E.; van Deursen, A.J.A.M.; van Dijk, J.A.G.M.; de Haan, J. Determinants of 21st-century skills and 21st-century digital skills for workers: A systematic literature review. *SAGE Open* **2020**, *10*, 215824401990017. [CrossRef]
107. Grinberga Zalite, G.; Zvirbule, A. Digital readiness and competitiveness of the EU higher education institutions: The COVID-19 pandemic impact. *Emerg. Sci. J.* **2020**, *4*, 297–304. [CrossRef]
108. National Board of Education. *Estado da Educação 2019*; National Board of Education: Lisboa, Portugal, 2020.
109. Lai, J.; Widmar, N.O. Revisiting the digital divide in the COVID-19 era. *Appl. Econ. Perspect. Policy* **2020**, *43*, 458–464. [CrossRef]
110. Alonso García, S.; Gómez García, G.; Sanz Prieto, M.; Moreno Guerrero, A.J.; Rodríguez Jiménez, C. The impact of term fake news on the scientific community. Scientific performance and mapping in Web of Science. *Soc. Sci.* **2020**, *9*, 73. [CrossRef]
111. Krishna, V.V. Open science and its enemies: Challenges for a sustainable science-society social contract. *J. Open Innov. Technol. Market. Complex.* **2020**, *6*, 61. [CrossRef]
112. Derrick, G.E. Editorial—Embracing how scholarly publishing can build a new research culture, post-COVID-19. *Publications* **2020**, *8*, 26. [CrossRef]
113. Kun, A. Time to acceptance of 3 days for papers about COVID-19. *Publications* **2020**, *8*, 30. [CrossRef]
114. O'Toole, J.M.; McKoy, K.; Freestone, M.; Osborn, J.-A. "Scientific literacy": An exercise in model building. *Educ. Sci.* **2020**, *10*, 204. [CrossRef]
115. Heise, C.; Pearce, J.M. From open access to open science: The path from scientific reality to open scientific communication. *SAGE Open* **2020**, *10*, 215824402091590. [CrossRef]
116. Hackett, E.J. Collaboration and sustainability: Making science useful, making useful science. *Sustainability* **2020**, *12*, 9361. [CrossRef]
117. Romero-Rodríguez, J.-M.; Ramírez-Montoya, M.-S.; Aznar-Díaz, I.; Hinojo-Lucena, F.-J. Social appropriation of knowledge as a key factor for local development and open innovation: A systematic review. *J. Open Innov. Technol. Market. Complex.* **2020**, *6*, 44. [CrossRef]
118. Possamai-Inesedy, A.; Nixon, A. A place to stand: Digital sociology and the Archimedean effect. *J. Sociol.* **2017**, *53*, 865–884. [CrossRef]
119. Nipo, D.T.; Lily, J.; Idris, S.; Pinjaman, S.; Bujang, I. Human development through the lens of digital literacy. *Bus. Econ. Res.* **2020**, *10*, 203. [CrossRef]
120. Martínez-Bravo, M.-C.; Sádaba-Chalezquer, C.; Serrano-Puche, J. Fifty years of digital literacy studies: A meta-research for interdisciplinary and conceptual convergence. *Prof. Inf.* **2020**, *29*, e290428. [CrossRef]
121. Van Dijk, J.; Hacker, K. The digital divide as a complex and dynamic phenomenon. *Inf. Soc.* **2003**, *19*, 315–326. [CrossRef]

122. Zukin, S.; Torpey, J. Editors' introduction to the special issue on the sociology of digital technology. *Theory Soc.* **2020**, *49*, 745–748. [CrossRef]

123. Pioneering Digital Sociology. *Contexts* **2014**, *13*, 6–8. [CrossRef]

124. Selwyn, N.; Nemorin, S.; Bulfin, S.; Johnson, N. Toward a digital sociology of school. In *Digital Sociologies*; Daniels, J., Gregory, K., McMillan Cottom, T., Eds.; Policy Press: Bristol, UK, 2016; pp. 143–158.

125. Koppel, I.; Langer, S. Basic digital literacy—Requirements and elements. *Rev. Práxis Educ.* **2020**, *16*, 326–347. [CrossRef]

126. Reder, S. Digital Inclusion and Digital Literacy in the United States: A Portrait from PIAAC's Survey of Adult Skills. Available online: http://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/551c3e82e4b0d2fede6481f9/1427914370277/Reder_PIAAC.pdf (accessed on 2 May 2021).

127. Haider, J.; Sundin, O. Information literacy challenges in digital culture: Conflicting engagements of trust and doubt. *Inf. Commun. Soc.* **2020**. [CrossRef]

128. Radovanović, D.; Holst, C.; Belur, S.B.; Srivastava, R.; Houngbonon, G.V.; Le Quentrec, E.; Miliza, J.; Winkler, A.S.; Noll, J. Digital literacy key performance indicators for sustainable development. *Soc. Incl.* **2020**, *8*, 151–167. [CrossRef]

129. Clark, D. Tech and me: An autoethnographic account of digital literacy as an identity performance. *Res. Learn. Technol.* **2020**, *28*, 1–14. [CrossRef]

130. Park, H.; Kim, H.S.; Park, H.W. A scientometric study of digital literacy, ICT literacy, information literacy, and media literacy. *J. Data Inf. Sci.* **2020**, *6*, 116–138. [CrossRef]

131. Buchholz, B.A.; DeHart, J.; Moorman, G. Digital citizenship during a global pandemic: Moving beyond digital literacy. *J. Adolesc. Adult Lit.* **2020**, *64*, 11–17. [CrossRef]

132. Spires, H.A. Critical perspectives on digital literacies: Creating a path forward. *Media Commun.* **2019**, *7*, 1–3. [CrossRef]

133. Reddy, P.; Sharma, B.; Chaudhary, K. Digital literacy: A review of literature. *Int. J. Technoethics* **2020**, *11*, 65–94. [CrossRef]

134. Serpa, S.; Santos, A.I. Critical literacy and literacies. *J. Educ. Teach. Soc. Stud.* **2020**, *2*, 18–23. [CrossRef]

135. Benavente, A.C.; Rosa, A.; Costa, A.F.; Ávila, P. *Literacy in Portugal. Results of Extensive and Monographic Research*; Calouste Gulbenkian Foundation and National Education Council Lisbon: Lisbon, Portugal, 1996.

136. Serpa, S.; Ferreira, C.M.; Santos, A.I. Fostering interdisciplinarity: Implications for social sciences. *Int. J. Soc. Sci. Stud.* **2017**, *5*, 44–49. [CrossRef]

137. McGinty, J.M. Developing a training program for digital literacy coaches for older adults: Lessons learned from the Train-the-Trainer Program. *J. Educ. Train. Stud.* **2020**, *8*, 62. [CrossRef]

138. Lee, S.H. Skills development driven by labor market demand. In *Anticipating and Preparing for Emerging Skills and Jobs. Education in the Asia-Pacific Region: Issues, Concerns and Prospects*; Panth, B., Maclean, R., Eds.; Springer: Singapore, 2020; pp. 271–277. [CrossRef]

139. From, J. Pedagogical digital competence—Between values, knowledge and skills. *High. Educ. Stud.* **2017**, *7*, 43. [CrossRef]

140. Razzaque, A. M-learning improves knowledge sharing over e-learning platforms to build higher education students' social capital. *SAGE Open* **2020**, *10*, 215824402092657. [CrossRef]

141. Lima, C.R.M.; Röder, E.S.F.; Carvalho, F.S.; Günther, H.F. Tensões e conflitos na vigilância digital de pessoas para controle da pandemia de COVID-19: A construção de smart cities, humanismo e esfera pública [Conflicts and tensions in the people's digital vigilance to control the COVID-19 pandemic: The construction of smart cities, humanism and public sphere]. *P2P e Inovação* **2020**, *7*, 241–257. [CrossRef]

142. Shmatko, N.; Volkova, G. Bridging the skill gap in robotics: Global and national environment. *SAGE Open* **2020**, *10*, 215824402095873. [CrossRef]

143. Vieten, U.M. The "new normal" and "pandemic populism": The COVID-19 crisis and anti-hygienic mobilisation of the far-right. *Soc. Sci.* **2020**, *9*, 165. [CrossRef]

144. Whitworth, A. Fostering digital skills and competencies through discursive mapping of information landscapes. In *European Higher Education Area: Challenges for a New Decade*; Curaj, A., Deca, L., Pricopie, R., Eds.; Springer: Cham, Switzerland, 2020; pp. 531–543. [CrossRef]

145. Lestariningsih, E.; Madhakomala, R.; Asmawi, M.; Hamidah, C. The Effect of Soft Skills Competency, Teamwork, and Innovative Work Behavior on the Quality of Human Resources in the Digital Era. In Proceedings of the 1st Unimed International Conference on Economics Education and Social Science, Medan, Indonesia, 31 October 2018; pp. 860–866. [CrossRef]

146. UNESCO. *Education for Sustainable Development Goals. Learning Objectives*; United Nations, Educational, Scientific and Cultural Organization: Paris, France, 2017.

147. Alqahtani, A.Y.; Rajkhan, A.A. E-Learning critical success factors during the COVID-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. *Educ. Sci.* **2020**, *10*, 216. [CrossRef]

148. Garcia, M. An overview of innovations in online learning. In *Anticipating and Preparing for Emerging Skills and Jobs. Education in the Asia-Pacific: Issues, Concerns and Prospects*; Panth, B., Maclean, R., Eds.; Springer: Singapore, 2020; pp. 191–198. [CrossRef]

149. Lassoued, Z.; Alhendawi, M.; Bashitialshaaer, R. An exploratory study of the obstacles for achieving quality in distance learning during the COVID-19 pandemic. *Educ. Sci.* **2020**, *10*, 232. [CrossRef]

150. Alali, R.A. Effectiveness of a proposed program in developing practices and modifying beliefs of practitioner teachers about the flipped classroom. *SAGE Open* **2020**, *10*, 215824402091977. [CrossRef]

151. Väisänen, S.; Hirsto, L. How can flipped classroom approach support the development of university students' working life skills? University teachers' viewpoint. *Educ. Sci.* **2020**, *10*, 366. [CrossRef]
152. Bachiller, P.; Badía, G. The flip teaching as tool to improving students' sustainable learning performance in a financial course. *Sustainability* **2020**, *12*, 9998. [CrossRef]
153. Colomo-Magaña, E.; Soto-Varela, R.; Ruiz-Palmero, J.; Gómez-García, M. University students' perception of the usefulness of the flipped classroom methodology. *Educ. Sci.* **2020**, *10*, 275. [CrossRef]
154. Ngereja, B.; Hussein, B.; Andersen, B. Does Project-Based Learning (PBL) promote student learning? A performance evaluation. *Educ. Sci.* **2020**, *10*, 330. [CrossRef]
155. Serpa, S.; Ferreira, C.M.; Santos, A.I.; Teixeira, R. Participatory action research in higher education. *Int. J. Soc. Sci. Stud.* **2018**, *6*, 1–7. [CrossRef]
156. Sá, M.J.; Serpa, S. Cultural dimension in internationalization of the curriculum in higher education. *Educ. Sci.* **2020**, *10*, 375. [CrossRef]
157. Santos, A.I.; Serpa, S. Flipped classroom for an active learning. *J. Educ. e-Learn. Res.* **2020**, *7*, 167–173. [CrossRef]
158. Serpa, S.; Sá, M.J.; Ferreira, C.M. Organizational learning culture in effective improvement of educational organizations. *Int. J. Educ. Organ. Leadersh.* **2020**, *27*, 47–68. [CrossRef]
159. Moreiro-González, J.A.; Paletta, F.C. Competencias y destrezas para la actuación profesional en ambientes digitales en ciencia de la información [Competences and skills for professional performance in digital environments in information science]. *Inf. Soc. Estud.* **2019**, *29*. [CrossRef]
160. Santos, A.I.; Ferreira, C.M.; Sá, M.J.; Serpa, S. Reading on paper and scrolling text on a screen in academic learning. *Acad. J. Interdiscip. Stud.* **2019**, *8*, 135–143. [CrossRef]
161. Sá, M.J.; Ferreira, C.M.; Serpa, S. Virtual and face-to-face academic conferences: Comparison and potentials. *J. Educ. Soc. Res.* **2019**, *9*, 35–47. [CrossRef]
162. Allam, Z. Demystifying the aspect of quality in higher education: Insights from Saudi Arabia. *SAGE Open* **2020**, *10*, 1–8. [CrossRef]
163. Kümmel, E.; Moskaliuk, J.; Cress, U.; Kimmerle, J. Digital learning environments in higher education: A literature review of the role of individual vs. social settings for measuring learning outcomes. *Educ. Sci.* **2020**, *10*, 78. [CrossRef]
164. Lopes, M. Reconversão de Profissionais: Mais do Que uma Tendência, uma Necessidade [Retraining Professionals: More than a Trend, a Need]. Available online: https://hrportugal.sapo.pt/reconversao-de-profissionais-mais-do-que-uma-tendencia-uma-necessidade-video/?utm_source=dlvr.it&utm_medium=facebook (accessed on 2 May 2021).
165. Ferreira, C.M.; Serpa, S. Online visibility, social networks and glamorous scientific publications. *Int. J. Soc. Sci. Stud.* **2018**, *6*, 58–66. [CrossRef]
166. Roche, J.; Bell, L.; Galvão, C.; Golumbic, Y.N.; Kloetzer, L.; Knoben, N.; Laakso, M.; Lorke, J.; Mannion, G.; Massetti, L.; et al. Citizen science, education, and learning: Challenges and opportunities. *Front. Sociol.* **2020**, 5. [CrossRef]
167. Um, W. Foreword. In *Anticipating and Preparing for Emerging Skills and Jobs. Education in the Asia-Pacific Region: Issues, Concerns and Prospects*; Panth, B., Maclean, R., Eds.; Springer: Singapore, 2020; pp. ix–x. [CrossRef]
168. Ejsmont, K.; Gladysz, B.; Corti, D.; Castaño, F.; Mohammed, W.M.; Martinez Lastra, J.L. Towards 'Lean Industry 4.0'—Current trends and future perspectives. *Cogent Bus. Manag.* **2020**, *7*, 1781995. [CrossRef]
169. Malhotra, P.; Singh, Y.; Anand, P.; Bangotra, D.K.; Singh, P.K.; Hong, W.-C. Internet of things: Evolution, concerns and security challenges. *Sensors* **2021**, *21*, 1809. [CrossRef]
170. Karimova, G.Z.; Shirkhanbeik, A. Society of things: An alternative vision of internet of things. *Cogent Soc. Sci.* **2015**, *1*, 1–7. [CrossRef]
171. Rupp, M.; Schneckenburger, M.; Merkel, M.; Börret, R.; Harrison, D.K. Industry 4.0: A technological-oriented definition based on bibliometric analysis and literature review. *J. Open Innov. Technol. Market. Complex.* **2021**, *7*, 68. [CrossRef]
172. Serpa, S.; Ferreira, C.M. Special Issue Society 5.0: Innovation, Uncertainty and Social Sciences. Available online: http://www.mdpi.com/journal/socsci/special_issues/Society_5.0 (accessed on 1 May 2021).
173. Sá, M.J.; Santos, A.I.; Serpa, S.; Ferreira, C.M. Digital literacy in digital Society 5.0: Some challenges. *Acad. J. Interdiscip. Stud.* **2021**, *10*, 1–9. [CrossRef]
174. Nadolu, B.; Nadolu, D. Homo interneticus—The sociological reality of mobile online being. *Sustainability* **2020**, *12*, 1800. [CrossRef]
175. Guillén-Gámez, F.D.; Mayorga-Fernández, M.J.; Contreras-Rosado, J.A. Incidence of gender in the digital competence of higher education teachers in research work: Analysis with descriptive and comparative methods. *Educ. Sci.* **2021**, *11*, 98. [CrossRef]
176. Chen, C.-H.; Liu, C.-L.; Hui, B.P.H.; Chung, M.-L. Does education background affect digital equal opportunity and the political participation of sustainable digital citizens? A Taiwan case. *Sustainability* **2020**, *12*, 1359. [CrossRef]
177. Cassells, L.; Dlamini, N.N. Educating digital citizens through curricular incorporation. *Int. J. Inf. Commun. Technol. Educ.* **2019**, *15*, 11–29. [CrossRef]
178. Archer, A.; Wildman, N. Internet access as an essential social good. In *The New Common*; Aarts, E., Fleuren, H., Sitskoorn, M., Wilthagen, T., Eds.; Springer: Cham, Switzerland, 2021; pp. 29–33. [CrossRef]
179. Passey, D. Digital technologies—And teacher wellbeing? *Educ. Sci.* **2021**, *11*, 117. [CrossRef]
180. Abad-Segura, E.; González-Zamar, M.-D.; Infante-Moro, J.C.; Ruipérez García, G. Sustainable management of digital transformation in higher education: Global research trends. *Sustainability* **2020**, *12*, 2107. [CrossRef]
181. Rahm, L. Educational imaginaries: A genealogy of the digital citizen. *Linköping Stud. Behav. Sci.* **2019**. [CrossRef]

182. Begishev, I.; Kirpichnikov, D.; Latypova, E.; Nechaeva, E.; Tasakov, S. Criminal legal support for safeguarding the citizens' digital rights. In Proceedings of the SHS Web of Conferences, Proceedings of the 3rd International Scientific Conference on New Industrialization and Digitalization, (NID 2020), Ekaterinburg, Russia, 12 December 2020; EDP Sciences: Roubaix, France, 2021; Volume 93, p. 02023. [CrossRef]

183. Dmitrik, N. Digital state, digital citizen: Making fair and effective rules for a digital world. *Leg. Issues Digit. Age* **2020**, *1*, 54–78. [CrossRef]

184. Lubkov, A.; Gordienko, O.; Sokolova, A. A humanitarian approach to the digitization of education. *Educ. Self Dev.* **2020**, *15*, 89–96. [CrossRef]

185. Ostafiichuk, L. Digital technologies in litigation vs digital human rights. *Eur. J. Law Public Adm.* **2021**, *7*, 118–129. [CrossRef]

186. Lozano-Díaz, A.; Fernández-Prados, J.S. Educating digital citizens: An opportunity to critical and activist perspective of sustainable development goals. *Sustainability* **2020**, *12*, 7260. [CrossRef]

187. Stürmer, M. Characteristics of digital sustainability. In Proceedings of the 8th International Conference on Theory and Practice of Electronic Governance, ICEGOV'14, Guimarães, Portugal, 27–30 October 2014; pp. 494–495. [CrossRef]

188. Feng, H. Digital technologies: Sustainable innovations for improving teaching and learning. *Innov. Educ. Teach. Int.* **2020**, *57*, 506–508. [CrossRef]

189. Ben-Eliyahu, A. Sustainable learning in education. *Sustainability* **2021**, *13*, 4250. [CrossRef]

190. Serpa, S. An overview of the concept of organisational culture. *Int. Bus. Manag.* **2016**, *10*, 51–61. Available online: http://docsdrive.com/pdfs/medwelljournals/ibm/2016/51-61.pdf (accessed on 5 May 2021).

191. Domingo-Coscolla, M.; Bosco, A.; Carrasco Segovia, S.; Sánchez Valero, J.A. Fomentando la competencia digital docente en la universidad: Percepción de estudiantes y docentes [Fostering teacher's digital competence at university: The perception of students and teachers]. *Rev. de Investig. Educ.* **2020**, *38*, 167–182. [CrossRef]

192. Santos, A.I.; Serpa, S. Digital literacy. Scholarly Community Encyclopedia. 2019. Available online: https://encyclopedia.pub/103 (accessed on 3 May 2021).

193. Daniela, L. Concept of smart pedagogy for learning in a digital world. In *Epistemological Approaches to Digital Learning in Educational Contexts*; Routledge: London, UK, 2020; pp. 1–16. [CrossRef]

194. Spector, J.M. Conceptualizing the emerging field of smart learning environments. *Smart Learn. Environ.* **2014**, *1*, 5–10. [CrossRef]

195. Hoel, T.; Mason, J. Standards for smart education—Towards a development framework. *Smart Learn. Environ.* **2018**, *5*, 1–25. [CrossRef]

196. Martín, A.C.; Alario-Hoyos, S.; Kloos, C.D. Smart education: A review and future research directions. *Proceedings* **2019**, *31*, 57. [CrossRef]

197. Dzobelova, V.B.; Aguzarova, L.A.; Olisaeva, A.V.; Kornilova, E.E. Digital Technologies in Education and their Influence on Modern Society. In Proceedings of the "New Silk Road: Business Cooperation and Prospective of Economic Development" (NSRBCPED 2019), St. Petersburg, Russia, Prague, Czech Republic, 7–8 November 2019. [CrossRef]

198. Serpa, S. A reflection on sociology of education. *Int. J. Soc. Sci. Stud.* **2018**, *6*, 33–39. [CrossRef]

199. Borawska-Kalbarczyk, K.; Tołwińska, B.; Korzeniecka-Bondar, A. From smart teaching to smart learning in the fast-changing digital world. In *Didactics of Smart Pedagogy: Smart Pedagogy for Technology Enhanced Learning*; Daniela, L., Ed.; Springer: New York, NY, USA, 2019; pp. 23–40.

200. Martínez-Heredia, N. Desafíos en la era digital actual: TIC y personas seniors de la Universidad de Granada (España) [Current challenge in the digital age: ICT and the elderly at University of Granada (Spain)]. *Texto Livre Ling. e Tecnol.* **2020**, *13*, 82–95. [CrossRef]

201. Garzón Artacho, E.; Martínez, T.S.; Ortega Martín, J.L.; Marín Marín, J.A.; Gómez García, G. Teacher training in lifelong learning—The importance of digital competence in the encouragement of teaching innovation. *Sustainability* **2020**, *12*, 2852. [CrossRef]

202. Rogerson, S. Rebooting ethics education in the digital age. *Acad. Lett.* **2021**. [CrossRef]

203. Rogerson, S. Aspects of social responsibility in the information society. In *Social and Economic Transformation in the Digital Era*; Doukidis, G., Mylonopoulos, N., Pouloudi, N., Eds.; IGI Global: Hershey, PA, USA, 2004; pp. 31–46. [CrossRef]

204. Sklar, J. 'Fadiga Zoom'—Videochamadas em Excesso e os Efeitos no Cérebro [Zoom Fatigue—Excessive Video Calls and Brain effects]. 2020. Available online: https://www.natgeo.pt/ciencia/2020/05/fadiga-zoom-videochamadas-em-excesso-e-os-efeitos-no-cerebro?utm_source=Facebook&utm_medium=PromotedPost&utm_campaign=AO&utm_content=Site_12%2F06_16%3A00&fbclid=IwAR021o74VpzQX4Vp32TfC9kzfPpWBrWz4BZSlAKewXxSLz52R3Scak7MsME (accessed on 2 May 2021).

205. Vivitsou, M. Digitalisation in education, allusions and references. *Cent. Educ. Policy Stud. J.* **2019**, *9*, 117. [CrossRef]

206. Freire, P.; Macedo, D. Literacy. In *Reading the Word & the World*; Taylor & Francis Library: London, UK, 2005. First published in 1987.

207. Alakeson, V.; Wilsdon, J. Digital sustainability in Europe. *J. Ind. Ecol.* **2008**, *6*, 10–12. [CrossRef]

208. Serpa, S.; Ferreira, C.M.; Sá, M.J.; Santos, A.I. Dissemination of knowledge in the digital society. In *Digital Society and Social Dynamics*; Serpa, S., Ferreira, C.M., Sá, M.J., Santos, A.I., Eds.; Services for Science and Education: Birmingham, UK, 2020; pp. 2–16.

209. Scholz, R. Sustainable digital environments: What major challenges is humankind facing? *Sustainability* **2016**, *8*, 726. [CrossRef]

210. Coeckelbergh, M. The postdigital in pandemic times: A comment on the Covid-19 crisis and its political epistemologies. *Postdigital Sci. Educ.* **2020**, *2*, 547–550. [CrossRef]
211. Mañero, J. Postdigital brave new world and its educational implications. *Postdigital Sci. Educ.* **2020**, 1–5. [CrossRef]
212. Illich, I. *Deschooling Society*; Kindle Edition; KKIEN Publ. Int.: Milano, Italy, 2013. First published in 1970.