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## **RETHINKING TEACHER TRAINING: COVID-19 AND THE RISE OF E-LEARNING**

### **NOWE PODEJŚCIE DO SZKOLENIA NAUCZYCIELI: COVID-19 I ROZWÓJ E-LEARNINGU**

#### **Summary**

The Covid-19 pandemic has caused an exponential change in the educational environment. The impact of epidemiological situation has been so powerful, that it can be considered that a new paradigm has been born based on semi-presence as new didactic normality. We witness the new and accelerated context where Information and Communication Technologies (ICT) have acquired a greater role than they used to ever have. Under this new perspective, which also involves a strong reflection on the teaching-learning processes, a review of existing technological resources and their functionality at present is proposed. Taking all of this into consideration, during the beginning of the 21st century the technological advances in the field of education have been significant. Management platforms, resources on the Internet, or other media and simultaneous interaction are some of the key tools in a world immersed in a rethinking that goes far beyond a classroom.

**Keywords:** e-learning, digital competence, higher education, ICTs.

#### **Streszczenie**

Pandemia Covid-19 spowodowała ogromną zmianę w środowisku edukacyjnym. Wpływ sytuacji epidemiologicznej był tak silny, że można uznać, iż powstał nowy paradygmat oparty na „półobecności” jako nowej normie dydaktycznej. Jesteśmy świadkami nowego kontekstu, w którym technologie informacyjne i komunikacyjne (ICT) zyskały większą rolę niż kiedykolwiek. W tej nowej perspektywie, która obejmuje również silną refleksję nad procesami nauczania i uczenia się, proponuje się przegląd istniejących zasobów technologicznych i ich aktualnej funkcjonalności. Biorąc pod uwagę powyższe, na początku XXI wieku postęp technologiczny w dziedzinie edukacji był bardzo znaczący. Platformy zarządzania, zasoby Internetowe lub inne media i interakcja symultaniczna to tylko niektóre z kluczowych narzędzi w świecie objętym rewolucyjnym podejściem do nauczania, które wykraczają daleko poza salę lekcyjną.

**Słowa kluczowe:** e-learning, kompetencje cyfrowe, szkolnictwo wyższe, technologie informacyjne i komunikacyjne.

## ICT in a digital educational environment

It was understood that society was immersed in constant change, but not so much. The arrival of the pandemic has revolutionized all aspects of life, as well as the different areas that makeup life. A new revolution, unfortunately, this time clearly negative, which follows a much accelerated process during these first two decades of this 21<sup>st</sup> century. In the future, we will live together with means that will generate the sensation that what we lived at the beginning of the 21<sup>st</sup> century was the beginning of something much bigger. The object of all these affirmations is the ICTs, new elements that, as Carneiro, Toscano, and Díaz<sup>1</sup> already stated, have caused total changes in society, culture, and humanity itself. A sensation that this new decade has accentuated and that, foreseeably, the future will increase in ways that even today is unimaginable.

One could say that this is the nature of change, but also the opposite. What is not debatable is that ICTs have not come to stay; they have come to be internalized every time in the daily routine of the human being. The signs of all these are evident and cover almost everything: daily habits such as looking at the time of making purchases, interpersonal relationships, bureaucratic tasks, or the evolution of research topics. In this sense, it can be clearly seen in a time span of 20 years: the original lines of research in educational technology (Area)<sup>2</sup> to the development of global publications which include unimaginable means such as Artificial Intelligence (AI) (Cantu-Ortiz, Sanchez, Garrido, Terashima-Marin & Brena)<sup>3</sup> or the Mixed Reality (RM) (Cochrane, Narayan & Birt)<sup>4</sup>. That is to say, the current possibilities are different from those of previous times just as this will happen within a decade.

The data provided by the Instituto Nacional de Estadística of Spain contribute to this feeling that is being experienced in relation to ICTs. One of the most relevant values during the last years is access to the Internet in homes, a very significant annual increase that in 2019 has been 91.4% (INE)<sup>5</sup>. In other words, more than nine out of every ten households in Spain have Internet access in their homes. It is striking, although more so than the trend incorporated into society,

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<sup>1</sup> R. Carneiro, J. Toscano & T. Díaz, *Los desafíos de las TIC para el cambio educativo*, Madrid, OEI – Fundación Santillana. 2000.

<sup>2</sup> M. Area, Bajo el efecto 2000. Líneas de investigación sobre Tecnología Educativa en España, *Revista Interuniversitaria de Tecnología Educativa*, 0, 98-113, 2020.

<sup>3</sup> F.J. Cantu-Ortiz, N.G. Sánchez, L. Garrido, H. Terashima-Marin H. & R.F. Brena, An artificial intelligence educational strategy for the digital transformation, *International Journal of Interactive Design And Manufacturing – IJIDEM*, 2020. doi: 10.1007/s12008-020-00702-8.

<sup>4</sup> T. Cochrane, V. Narayan & J. Birt, Special collection on mobile mixed reality 2019 update, *Research in learning technology*, XXVIII, 2020. doi: 10.25304/rlt.v28.2424.

<sup>5</sup> Instituto Nacional de Estadística, *Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares*, 2020. Retrieved from [https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica\\_C&cid=1254736176741&menu=ultiDatos&idp=1254735576692](https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176741&menu=ultiDatos&idp=1254735576692).

that this number rises to 100%, showing how it is no longer a complimentary resource but a necessary one. In fact, smartphones have played an important role since they have been, and are being, such a big change in the social game that it is probably the most important ICT modification of the 21st century. This is taking into account its impact on society, not its own functionality as then medical advances would be ahead.

If we look only at smartphones, their integration into society has been total. They have become the visible head of technological change, which has had repercussions such as the growth of the telephone industry due to the incorporation of the Internet or cameras to these devices. In fact, its impact on the educational field can be seen in the boom of research, studies, and publications of the so-called mobile learning (Crompton & Burke)<sup>6</sup>, and that is based on the use of these devices as a means of teaching. A strategy that, in addition to the educational possibilities, has to be explained by the expansion of these digital tools whose sales figures increase every year. In the case of Spain, for example, there are more than 3 million (INE). Questions that expose the role of ICTs and, at the same time, call for a deep reflection on their adaptation to the educational field.

### Technological resources as a means of development

The current context is marked by the emergence of ICTs. If we focus on its impact in the educational field, its adaptation and incorporation during the last decades have been exponential. At the end of the 20th century, the main media were television, radio, and the first computers. Two decades after the beginning of this new century, the existing media, led by smartphones, provide significantly different qualitative and quantitative differences. Three of the new media that are more in vogue, although still in development, are Augmented Reality (AR) (Cai, Liu, Wang, Liu & Liang)<sup>7</sup>, Virtual Reality (VR), and the RM mentioned above. Possibilities that are evolving towards their application in educational contexts and that even some apps already exist in operation as Quiver.

Despite the fact that at present the means are relatively broad, there is still a time when the real technological application is expected to be near. This is the educational field means that different variants or resources are already being applied but further integration is still expected in the future. A process accelerated by society itself, again the smartphone as the main digital object and even

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<sup>6</sup> H. Crompton & D. Burke, Mobile learning and pedagogical opportunities: a configurative systematic review of Prek-12 research using the SAMR framework, *Computers & Education*, CLVI, 2020. doi: 10.1016/j.compedu.2020.103945.

<sup>7</sup> S. Cai, C.H. Liu, T. Wang, E.R. Liu & J.C. Liang, Effects of learning physics using Augmented Reality on student's self-efficacy and conceptions of learning, *British Journal of Educational Technology*, 2020. doi: 10.1111/bjjet.13020.

laptops, but also by the educational institutions themselves or through legislation. In this sense, in the case of Spain, it is key to highlight the Ley Orgánica de Educación 2/2006 (LOE, 2006) as it was the first space in which ICT approaches were included in educational legislation. Its contribution was oriented towards the need for training and also incorporated "Digital Competence" as a concept within the educational framework.

Currently, the current educational legislation in Spain is the Ley Orgánica 8/2013 para la Mejora de la Calidad Educativa (LOMCE, 2013), a document that still maintains the commitment to the integration of ICTs. A logical bet if we take into consideration the technological development and how the students are immersed in constant digital progress. Logically, these advances also affect the teaching staff, one of the agents on which most focus has been placed in terms of educational research (Cabero, Gutierrez, Palacio & Barroso)<sup>8</sup>. On the other hand, the conceptualization of Digital Competence, a terminology in constant variation and from which a professional uncertainty is derived, is also highlighted (Liesa, Latorre, Vázquez & Sierra)<sup>9</sup>. Two issues that reflect the current state of educational technology, a constant and undefined change towards which we must orient ourselves (Carpenter et al.)<sup>10</sup>.

The obligation to incorporate technology into the educational process, beyond its legislative incorporation, is also due to social demands. Today's students, who have been qualified as digital natives for years, are a clear example of how ICTs do not surround the school but occupy it. Of course, the fact of being surrounded by mobile devices does not imply perfect handling, as well as a constant reflection on their personal use (Hatlevik, Gudmundsdottir & Loi)<sup>11</sup>. A debate that focuses on education but that brings together the two contexts of students as they are inside and outside the school. Two contexts that, at the same time, are also in a debate since there are some approaches that defend the school as a closed space while others bet on the approach to the social reality of the students. What seems more logical, always in a coherent way, is the search for educational improvement as long as ICTs favor it.

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<sup>8</sup> J. Cabero, J.J. Gutierrez, A. Palacios & J. Barroso, Development of the teacher digital competence validation of DigCompEdu check-in questionnaire in the University context of Andalusia (Spain), *Sustainability*, XII(XV), 2020. doi: 10.3390/su12156094.

<sup>9</sup> M. Liesa, C. Latorre, S. Vázquez & V. Sierra, The technological challenge facing higher education professors: perception of ICT tools for developing 21st century skills, *Sustainability*, XII(XIII), 2020. doi: 10.3390/su12135339.

<sup>10</sup> J.P. Carpenter, J.M. Rosenberg, T.A. Dousay, E. Romero, T. Trust, A. Kessler, M. Phillips, S.A. Morrison, C. Fischer & D.G. Krutka, What should teacher educators know about technology? Perspective and self-assessments. *Teaching and teacher education*, XCV, 2020. doi: 10.1016/j.tate.2020.103124.

<sup>11</sup> O.E. Hatlevik, G.B. Gudmundsdottir & M. Loi, Digital diversity among upper secondary students: a multilevel analysis of the relationship between cultural capital, self-efficacy, strategic use of information and digital competence, *Computers & Education*, LXXXI: 345-353, 2020. doi: 10.1016/j.compedu.2014.10.019

The incorporation of ICTs is a theme that has been worked on quite a lot in the field of research. In fact, Lozano<sup>12</sup> contributed a conceptual variant when considering the Learning and Communication Technologies (LCT) as the next step and application of the ICTs in the classroom. His sense, almost a decade ago, was to understand the ICTs as a means and not as an educational end, to know how to manage a resource to make it a way of learning. The reality is that the possibilities offered by ICTs today are very different from any other technology developed in previous times, so it is consistent to guide and work the potential that they offer, especially in what happens to education. Processes such as the preparation of educational materials are different, for example, slide presentations imply new resources, preparation, and processes (Cabero)<sup>13</sup> compared to previous ICT techniques.

ICTs offer advantages but also have limitations or disadvantages, like almost anything else in life. In recent times, Higher Education has played an important role since it has become the core of work, especially in educational research. Now, with the advent of a global pandemic, the new course apparently faced by it has had to be forced. All educational stages have had to try to adapt and adapt their methodologies through ICTs but it is in the case of Higher Education where research in recent years can be more effective. In this sense, it is worth mentioning the publication 2020 EDUCAUSE Horizon Report (Brown, McCormack, Reeves, Brooks, and Grajek)<sup>14</sup>, which is a clear indicator of the short or medium-term future of ICTs and Higher Education. These guidelines did not include the appearance of the Covid-19 but they can provide a vision of what resources can be added to those currently available.

### **E-learning as support and via digital education**

In recent years, especially in the last decade, the commitment to the so-called e-learning has been a pattern quite considered both in Higher Education and in educational research (Pham, Limbu, Bui, Nguyen & Pham)<sup>15</sup>. Its conception has been changing over the years due to the great advance of means since

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<sup>12</sup> R. Lozano, De las TIC a las TAC: tecnologías del aprendizaje y del conocimiento, *Anuario ThinkEPI*, V: 45-47. 2011. Retrieved from <https://recyt.fecyt.es/index.php/ThinkEPI/article/viewFile/30465/16032>.

<sup>13</sup> J. Cabero, Formación del profesorado universitario en Tic. Aplicación del método Delphi para la selección de los contenidos formativos, *Educación XXI*, I(XVII): 109- 132, 2014. doi: <http://doi.org/doi:10.5944/educxx1.17.1.10707>.

<sup>14</sup> M. Brown, M. McCormack, J. Reeves, C. Brooks & S. Grajek, *2020 EDUCAUSE Horizon Report, Teaching and Learning Edition*, Louisville, Educause, 2020.

<sup>15</sup> L. Pham, Y.B. Limbu, T.K. Bui, H.T. Nguyen & L. Pham, Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam, *International Journal of Educational Technology in Higher Education*, XVI, 2020. doi: 10.1186/s41239-019-0136-3.

those existing in 2010 and all those that are happening now are not the same. All this has also had an impact on all the factors that e-learning covers: the preparation of the message, the choice of medium, and student learning. In terms of preparation, the pandemic has increased the importance of content, an act that has had to be produced in a very short period of time due to the immersion already in the academic year. Some studies developed during this time explain this, how e-learning can be a great medium but with adequate preparation in both content and activities (Ana et al.)<sup>16</sup>.

We can talk about the medium but the two main agents of the teaching-learning process, the students and the pupils, are the main ones affected by this methodology. With respect to the teaching staff, as previously mentioned, their training or personal preparation acquires vital importance in terms of the adaptation of ICT to education. While it is true that being competent in a context such as technology is a very complex issue, since the progress does not stop every year, especially in higher education, the preparation of teachers should be more considered (Ivaniuk)<sup>17</sup>. A reality in which the students must also be included, who play a fundamental role in the implementation of e-learning and the real development of Digital Competence (Contreras, Guitierrez, Vergara, and Kayat)<sup>18</sup>.

In this chapter, rather than delve into the message or the agents, we intend to explain what means currently exist based on e-learning that can be used in a context marked by the pandemic. For this reason, the following will present different platforms, resources, or digital tools that have channeled educational practices during confinement (Almaiah, Al-Khasawneh & Althunibat)<sup>19</sup> and that, in turn, will play a key role in the policies of semi-presence in Higher Education. Each one of them, although in some cases will be presented as a whole, will be accompanied by the potentialities or limitations that they currently present.

During the last years, it is having a great presence thanks to its nature and it is the learning platforms. This is a medium whose impact has expanded as online learning has been an initiative with increasing importance thanks to approaches

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<sup>16</sup> A. Ana, A.D. Minghat, P. Purnawarman, S. Saripudin, M. Muktiarni, V. Dwiyantri & S.S. Mustakim, Students' perceptions of the twists and turns of e-learning in the midst of the Covid 19 outbreak, *Revista Romaneasca Pentru Educatie Multidimensionala*, XII(I): 15–26, 2020. doi: 10.18662/rrem/12.1sup2/242 .

<sup>17</sup> I.V. Ivaniuk, Teachers' digital competency development: experience of scandinavian countries, *Information Technologies and Learning Tools*, LXXII(IV): 81–90, 2020. doi: 10.33407/itlt.v72i4.3081.

<sup>18</sup> J.C.Z. Contreras, R.A.M. Gutierrez, Y.K.A. Vergara & G.M. Kayat, School education and digital competence of students and teachers, *EDUWEB-Revista de Tecnología de Información y Comunicación en Educación*, X(I): 41–53, 2016.

<sup>19</sup> M.A. Almaiah, A. Al-Khasawneh & A. Althunibat, Exploring the critical challenges and factors influencing the e-learning system usage during Covid-19 pandemic, *Educacion and Information Technologies*, 2020. doi: 10.1007/s10639-020-10219-y

such as the Massive Open Online Courses (MOOC). Its principles are based on non-presential teaching through digital resources (Albelbisi)<sup>20</sup> that, at present, can be concentrated in the learning platforms. The best known are Moodle or Blackboard and this teaching model has clear importance in terms of channeling digital resources in higher education stages (Vázquez, Lopez, and Martín)<sup>21</sup>. In fact on the Moodle platform are numerous studies that have shown its applicability in this new context (Espinoza, Vasquez, Yacelga & Pillajo)<sup>22</sup>, the intrinsic factors of this methodology (Aikina & Bolsunovskaya)<sup>23</sup>, or the results themselves that are obtained (Bi & Shi)<sup>24</sup>.

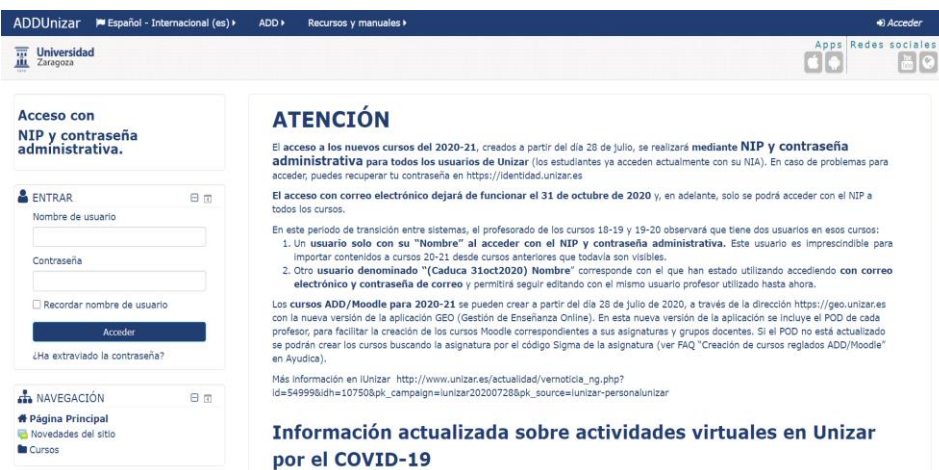


Figure 1. Moodle as a key resource at University of Zaragoza

Another of the digital pieces whose relevance has emerged after the arrival of the pandemic has been the video communication channels. Those platforms based on synchronization and bi-directionality, such as Jitsi or Zoom, have espe-

<sup>20</sup> N. Albelbisi, Development and validation of the MOOC success scale (MOOC-SS), *Education and Information Technologies*, 2020. doi: 10.1007/s10639-020-10186-4.

<sup>21</sup> E. Vázquez, E. López & A.H. Martín, Los nuevos entornos virtuales de aprendizaje permanente (MOOC). Un estudio diacrónico del estudiantado de la Universidad Pablo de Olavide (2015–2017) EDMETIC, *Revista de Educación Mediática y TIC*, VII(I): 350–371, 2018. doi: <https://doi.org/10.21071/edmetic.v7i1.10080>.

<sup>22</sup> J.L.A. Espinoza, R.A.D. Vásquez, A.R.L. Yacelga & A.L.S. Pillajo, Moodle: alternative attention to unfinished schooling in the Imbura, *Dilemas Contemporaneos-Educación Política y Valores*, VI, 2019.

<sup>23</sup> T.Y. Aikina & L.M. Bolsunovskaya, Moodle based learning: motivating and demotivating factors, *International Journal of Emerging Technologies in Learning*, XV(II): 239–248, 2020. doi: 10.3991/ijet.v15i02.11297

<sup>24</sup> X. Bi & X.D. Shi, On the effects of computer-assisted teaching on learning results base don blended method, *International Journal of Emerging Technologies in Learning*, XIV(I): 58–70, 2019. doi: 10.3991/ijet.v14i01.9458

cially stood out, displacing Skype as a classic means of videoconferencing. In these cases, its application in all educational stages, but especially in Higher Education, has been the only way of teaching-learning. Its application has served and can serve for the teaching of different content, something that has not been overlooked for educational research: from the point of view of students (Ramachandran & Rodríguez)<sup>25</sup>, by how the content is transmitted and development is carried out (Cziboly & Bethlenfalvy)<sup>26</sup> or its management in a situation like the present (Fulfer et al.)<sup>27</sup>. The opposite situation is cases like Youtube, Vimeo, or other platforms in which the content is exposed in an asynchronous way, very useful for the MOOC methodology.

Primarily, the digital issue that has a great value is the digital resources themselves understood as those web pages, apps, or others whose value is to complement the training action. In this sense, the existence of this type of resource has grown exponentially during these years and the results have been seen today. Previously they were used in a complementary way to the classroom practice and during this time their role has been greater. In fact, it has been the methodology based on gamification, especially through Kahoot (Hernández & Belmonte)<sup>28</sup>, which has exposed how the means currently available can have a functional practice under these contexts of non-presence. All these platforms and resources show that technological progress is taking into consideration the educational field.

During the last few months, it has become necessary to reconsider what digital media exist on the market and how they can be adapted towards semi-presence in education. In the previous paragraphs, we have presented those digital resources whose use has been more significant during this stage, but it is also true that there are more alternatives. One of the main issues that we wanted to discuss in this brief section was that currently there are resources available that can support the educational system in such complex times as these. Especially in the case of Higher Education, the use of media such as Moodle and Zoom as management platforms and conducting non-presential classes have been key to the completion of the academic year 2019–2020.

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<sup>25</sup> R. Ramachandran & M.C. Rodríguez, Student perspectives on remote learning in a large organiz chemistry, *Journal of Chemical Education*, XCVII(IX): 2565–2572, 2020. doi: 10.1021/acs.jchemed.0c00572.

<sup>26</sup> A. Cziboly & A. Bethlenfalvy, Response to Covid-19 zooming in on online process drama, *Ride-The Journal of Applied Theatre and Performance*, 2020. doi: 10.1080/13569783.20.1816818.

<sup>27</sup> K.D. Fulfer, E. Watcher, J.L. Muzyka, L.T. Demoranville, J.E. Fieberg, J.D. Haile, D. Scott, Y. Song, J.M. Workman & K.J. Young, #StayCentred: maintaining personal education at centre college during Covid-19, *Journal of Chemical Education*, XCVII(IX): 2783–2787, 2020. doi: 10.1021/acs.jchemed.0c00726.

<sup>28</sup> J.P. Hernández & M.L. Belmonte, Assesment of the use of Kahoot! En face-to-face and virtual higher, *Education in the knowledge society*, XXI(XIII), 2020. doi: 10.14201/eks.22910.



## Discussion and conclusion

It is difficult at present to make statements even if they are in the short term future. Change, one of the intrinsic characteristics of the educational field, has taken hold of a reality in which development in any field is clearly conditioned. During the last few years, the advance of society was a constant and this was evident in the approaches set forth in research, studies, and proposals dealing with the educational context. What can be considered is that thanks to these last two decades, ICTs and education have been able to join their paths, to a lesser or greater degree, in a functional or realistic way. Digital platforms, videoconferences, resources or gamification are examples of the birth of methodologies such as e-learning or even m-learning.

Thinking that only through ICTs can be covered everything that involves education is not consistent. Although it is true that ICTs have exposed that the action of teaching-learning can be carried out, face-to-face learning is not replaceable. Besides, we must also consider a very important fact such as the digital gap, which has been clearly seen during these months. Not all institutions, teachers, and students have the same technological possibilities, so this factor is key. That is, this situation implies a new degree of rethinking the social-technological (Wilkerson, Wolfe, Deck, Wahler & Davis)<sup>29</sup>. A reflection that is being developed but that the pandemic and confinement have forced to rise to a new level.

The research that has put the focus on teacher and student training is numerous, a fact that especially in Spain should invite reflection. Especially when there are many works that expose the need to work the Digital Competence even of future teachers (Soler, Lafarga, and Ramos)<sup>30</sup>. Higher Education has had to adapt to a new paradigm but it is vital that it is capable of rethinking education in the 21st century in which the Covid-19 has shown that peace of mind can be temporary but that what has been done until then is very important.

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<sup>29</sup> D.A. Wilkerson, S.N. Wolfe, C.K. Deck, E.A. Wahler & T.S. Davis, Telebehavioral practise basics for social workers educators and clinicians responding to Covid-19, *Social Work Education*, 2020. doi: 10.1080/02615479.2020.1807926.

<sup>30</sup> Soler R., Lafarga P. & Ramos M. La Competencia Digital de docentes en formación en un contexto educativo de innovación tecnológica. In Hinojo F.J, Aznar I. & Cáceres M<sup>a</sup>. P. (Eds), *Avances en recursos TIC e innovación educativa*, 152–161, Madrid, Dykinson, 2019.

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