

Essay

Education after the Pandemic: What We Have (Not) Learned about Learning

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Abstract: During the pandemic, educational technologies have become an essential tool to provide education at a distance. The paper outlines basic assumptions of research on the effects of the pandemic on education and points out methodological flaws when these effects are directly related to the pandemic or to effects of educational technology on learning. Studies cannot be easily aggregated and must consider the institutional, national and cultural conditions of how the educational system reacted to the pandemic. The article discusses how the experiences during the pandemic will shape the future discussion of education after the pandemic. With regard to the use of digital technology, the future seems widely open and will largely depend on the interpretation and re-construction of these experiences during the pandemic by the actors in the field. Two contradictory visions for the role of educational technology in *education after the pandemic* seem possible: a pre- vs. post-digital view that imply fundamentally different perspectives for the future of education. A pre-digital re-construction implies a return “back to normal”, whereas a post-digital view tries to utilize the experiences of the pandemic for a consequential reform of education.

Keywords: educational technology; pandemic; future; social construction

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1. Introduction

There is a growing body of research on experiences and effects of the pandemic in education. In the following, we will categorize the different research approaches and will point out methodological challenges associated with this research. Then, we will ask if and how these results can be related to education after the pandemic, and what consequences and routes education after the pandemic might take.

2. Research on the Effects of the Pandemic

In the following, we will provide a short overview of the growing body of research reporting on the effects and experiences of the pandemic in education. We refer to international research (mainly existing reviews) about how the educational systems have managed to cope with the challenges of remote teaching during the crises and how these findings can be interpreted with regard to a post-pandemic future of education. Then, we will show that the interpretation of these results for the future of higher education can be interpreted quite differently.

Scholarly articles about education under the pandemic can be assigned to three categories, which we will discuss in the following section:

- a. Prescriptive papers aggregating available knowledge about educational technology for “Emergency Remote Teaching”.
- b. Theoretical analyses reflecting and framing the debate.
- c. Empirical studies on the effects of the pandemic on education.

Regarding (a): Several journals have published Special Issues about the pandemic providing a synthesis of experiences about “the best ways to respond to rapid shifts to

digitally intensive learning" (<https://www.springer.com/journal/11423/updates/19039268> (accessed on 1 March 2022) to inform the unassured practitioners that were confronted with an unprecedented challenge [1,2]. For example, *Educational Technology. Research & Development* has published a Special Issue, to "synthesize and inform the rapid development, deployment, and future of teaching and learning" [3,4].

It is not clear if and to what extent these pieces of advice from research did reach their audience and were able to provide the necessary knowledge to cope with teaching under the conditions of the pandemic. Furthermore, researchers from Ed Tech pointed out that "Emergency Remote Teaching", on the one hand, and "distance education with educational technology", on the other hand, have to be understood as two different challenges [5]. During the pandemic, teachers mainly were reproducing established practices of teaching and learning but with digital technology. Before the pandemic, the research literature on educational technology was heavily emphasizing the importance of re-composing instruction, rethinking instructional methods and making this a well-designed and coherent collaborative, strategic effort in a school. Based on these considerations of instructional design principles, concepts for digital learning should be outlined before a systematic map for the proliferation of technology is developed, including measures for training teachers [6].

Regarding (b): The journal *Postdigital Education and Science* has followed another, more qualitative approach, opening up the discussion based on a variety of data sources, personal testimonies and photographs, narratives and theoretical reasonings, describing "theory as an anti-pandemic practice" [7]. To some extent, this discussion questions mainstream approaches to research on Educational Technology (EdTech) which mostly has tried to capture phenomena by analytical observations in the tradition of empiricism.

Regarding (c): Then, a large number of empirical studies have addressed how education has responded to the pandemic and how shifting to remote teaching and home schooling made it possible to cope with the restraints of a lockdown. At the beginning of the pandemic, perceived failures to effectively move to digital learning often were related to a shortage of digital technology in education accompanied with insufficient experience of teachers on the use of digital technology for teaching. Additionally, some teachers were hesitant to adapt their teaching practices [8]. Furthermore, results have demonstrated how much conditions differed in the various parts of the world [9].

For the sector of schools, Bond et al. [10] have synthesized 81 studies from 38 countries with a focus on "what worked well in the online mode" (p. 9). They describe the variety of tools that had been applied successfully for remote teaching, pointing out that "standardized assessment for the online setting was challenging" (p. 13). They also refer to the fact that "social inequalities affected the capacity of some parents to provide materials and a suitable study space for their children" (p. 13). In this line of argument, Marioni et al. [11] emphasize the (possibly) long-term effects of remote teaching that often did not reach students that needed support most desperately. While many pupils could benefit from caring parents and homeschooling, other students were not able to receive a compensatory treatment. Azorín et al. [12] explain why, for Spain, an often cumbersome remote schooling strongly has endangered the political goal to "leave no one behind".

Similar results are reported for the sector of adult education: Stanistreet et al. [13], summarizing studies in *International Review of Education*, stated that "A central message of all the articles in this special issue is that the move to online learning has reinforced inequalities of access and participation in education, not only in schools and universities, but in adult education too."

For higher education, Bond et al. [14] provide a mapping of 282 empirical studies. Most of the studies relate to the individual reactions and attitudes of teachers and students confronted with the pandemic. Händel et al. [15] report that many students lack the necessary skills for self-regulated learning and have suffered from "stress-related emotions (worries, tension, joy, and overload) as well as social and emotional loneliness". Several studies demonstrate the frustration of students and teachers with the situation [16,17] and

point out issues of mental health [18]. Still, incoming evaluations of students' learning prove that remote emergency teaching in many cases was able to deliver similar and in some cases even better results than before [4].

Kaqinari et al. [19] show the substantial differences between countries in the intensity and breadth of using digital technology [20]. Laufer et al. [21] present results of interviews with leadership from higher education in 23 countries pointing out the necessity of “closing the digital divides and pathways forward ... towards inclusive, long-term visions for digital education, which emphasize collaboration over individual gain”. Thus, concerns about the rise of inequity as a consequence of the pandemic in the various sectors of education are growing [22–24].

Most of the published articles can be subsumed as empirical research papers. Due to the largely differing conditions, they provide an inhomogeneous view of positive and negative effects of the pandemic. In order to evaluate these findings with respect to the future of education, we will first need to look into the research designs—and their limitations—that these papers typically are based on.

3. Limitations of Research on the Pandemic

The most basic approach of research papers has been to ask students (and sometimes teachers or parents) about their experiences with learning during the pandemic. These data were important to identify the most oppressing needs for developing measures of teaching. However, from a research perspective, such a single point of data makes it difficult to interpret since they lack a reference from before the pandemic.

In other cases, two points of data collections—before and during the pandemic—have been available and allowed for a comparison. The question, however, remains how these two datasets should be interpreted and what such a comparison is able to reveal. Most often, it is assumed that the use of educational technology—as a reaction to the pandemic—can be interpreted as a *treatment* and would allow for an analysis of the effects of EdTech on learning. However, the introduction of EdTech has been confounded with many other changes and challenges for schools and families that came with the pandemic. Therefore, a comparison of learning before and during the pandemic cannot be attributed to the (increased) use of Ed Tech alone.

Furthermore, we have to consider that schools and countries have reacted to the pandemic quite differently. Some were reluctant to quickly adapt their methods of teaching, others switched more easily. Therefore, if we compare the two samples—before and during the pandemic—we are not able to learn about the effects of EdTech on learning, but about the way an institution has responded to the challenges of the pandemic and how they introduced digital technologies and instructional solutions.

More complicated, we have to consider that educational institutions are not the same and a strategy that is helpful at one institution might not be appropriate for another. A school might be privileged and have easy access to technology and motivated teachers; other schools might have to address students that were barely reachable since they did not have proper means to access the internet while staying at home.

Finally, we have to consider social, cultural and national aspects that interfere with all of the above correlations. Some countries have provided digital tools and appliances quickly, other countries were still struggling with deeply rooted cultural skepticism against digital technology (e.g., like in Germany: [8]). From this perspective, aggregations as well as comparisons between countries must be interpreted quite cautiously. It never is clear what factors contribute to the observed differences. It never is obvious to what extent it is appropriate to compare two institutions from different countries and in what dimensions they are distinct. From research methodology, it seems highly problematic to aggregate studies from various parts of the world assuming that the pandemic has affected educational systems similarly around the world. Additionally, comparisons between countries seem difficult since they do not consider other organizational and cultural

differences in an educational system that exist independently from the pandemic and most probably produce interaction effects that are not easy to control.

As a summary, we have identified different explanations for comparing data on learning before and during the pandemic. Research articles attribute possible effects as a result of:

1. the pandemic (broadly);
2. the use of EdTech on learning;
3. the use of EdTech under the special conditions of a pandemic (as “Remote Emergency Teaching”);
4. the different institutional responses of using EdTech during the pandemic,
5. teachers’/students’ characteristics facing an institutional response to using EdTech during the pandemic;
6. national, cultural, social, and socio-economic conditions contributing to the above effects.

In most cases, reported studies are not based on representative samples and often do not relate to a baseline before the pandemic that would allow for comparisons. When analyzing the research on education during the pandemic, it has also been recognized that much of teaching and learning has moved “undercover”, becoming more difficult to observe and to analyze than before (cf. [25]). Given the enormous impact of the pandemic on all levels of society, it is difficult to clearly identify causes for certain effects of the pandemic. The educational research literature primarily has focused effects of remote teaching, home schooling, etc., on learning results. However, the pandemic has affected people’s health and wellbeing to a much larger degree, resulting in an increase in depression, anxiety and other disorders in youths and adolescents [26]. Therefore, given the complexity of the chain of effects of the pandemic, we should be cautious not to simplify possible interrelations of causes and effects within the realm of education. To some degree, we probably must accept that it will not be possible to isolate the effects of the various parameters of education and educational technology on learning. People have been confronted by existential threats, they have been suffering from the virus or were afraid of catching the virus. People have lost their jobs and income, they developed depression and other disorders—with highly differing degrees of concerns in the various parts of the world where countries have reacted completely differently during the pandemic, and we must be careful not to generalize our experience with “education during the pandemic”.

Some studies have followed the most basic assumption, namely that an observed difference is a result of “the pandemic” or a result of the exposure to “EdTech” in education. Such a parsimonious explanation does not follow the discussion in EdTech research that, for a long time, has abandoned a deterministic view towards digital technology in learning. EdTech does not have a direct impact on teaching and learning as such, but should be seen as a potential to provide different learning experiences—if methods of instruction are adapted and innovations are introduced to an institution [27,28]. Educational change is not an immediate result of digital technology but of the joint effort of teachers and students to improve their practices of teaching and learning—while applying digital technology [29].

4. After the Pandemic

The question remains what research about education *during* the pandemic tells us about the time after the crises? (How) can we extrapolate from these experiences to the future of education? How will these experiences shape the future of learning? Whereas a lot of articles have been published about the shift towards digital learning during the pandemic, the move *out of the pandemic* seems to attract less attention with researchers. This can partly be attributed to viewing post-pandemic times as “shifting back to normal”, which obviously would not need further attention because it simply implies the reinstatement of an old system and a recollection of learned practices from before the pandemic.

With this, why would you need to analyze the return to something that was known about before?

Several researchers point out the social problems that the pandemic has intensified. There is ample evidence that the pandemic has widened social gaps in societies. Students with restricted housing conditions, limited internet access and poor digital equipment have been impaired by the pandemic more drastically. For example, Mac Domhnaill et al. [30] have demonstrated the impact of high-speed broadband availability on student engagement with distance learning during this period in Ireland. Blundell et al. [23] state “that the crisis does in itself have the potential to exacerbate some of these pre-existing inequalities fairly directly” (also [22,24]). In a study from Ives [31], students reported that most areas of quality of instruction were poorer after the transition, with *student engagement* dropping by the largest effect size. Chakraborty et al. [16] have presented data that indicate that students have experienced online education during the pandemic as more stressful and affecting their health and social life. Interestingly, however, Iglesias-Pradas et al. [32] found an “increase in students’ academic performance in emergency remote teaching and support the idea that organizational factors may contribute to successful implementation of emergency remote teaching”. Together, these results would *not* encourage us to continue with an extended use of digital teaching as introduced during the pandemic.

To some extent, teachers had tried to adapt their teaching with the use of educational technology. Will this contribute to a change in their attitudes and practices of teaching after the crisis? On the one hand, it might be assumed that the—to some extent—positive experience with educational technology will have a lasting impact on their behavior. Furthermore, students simply will increasingly expect the comfort of a digital delivery of instructional materials and interactive learning experiences. These experiences will not just be forgotten after the crises.

On the other hand, after the crises, we hopefully will not need to wear masks, we will not need to keep social distance, etc. We will return “back to normal”—also in education? Neil Mosley [33] asks: “So what has changed in the online education landscape of higher education? Well to a certain extent it’s as you were”. More controversially, Teräs et al. [34] ask: “Will they reinforce capitalist instrumental view of education or promote holistic human growth?”, pointing out the political implications of the directions the educational system can take.

While many universities are declaring a “return to normal” this transition is not as smooth as often anticipated. Politicians and university leadership declare that universities are “open again” and are relieved to call teachers and students to return to classes. However, some teachers and students are reluctant. Some teachers want to continue using the digital technology they have learned to adapt their instructional goals to successfully. Similarly, some students have come to learn the conveniences digital tools offer for flexible learning. At universities, students might have changed their routines, some have moved their domicile farther away or have picked up a job not easily compatible with fixed appointments in a lecture hall. Recently, Zawacki-Richter [35] has demonstrated how expectations of teachers and students have changed with the experience of the pandemic.

So, some institutions proclaiming the return to standard operating procedures believe they are returning to a pre-digital “back to normal” but they oversee how past experiences have shaped expectations and prospects of teachers and students alike. The notion of “hybrid courses” has become popular, which seems to have evolved as a descriptive, albeit vague term that opens various possibilities to organize courses in a wide range of activities on campus and remotely [36,37]. Skulmowski and Rey [38] speak about COVID-19 as an accelerator for the digitalization of (higher) education and expect major reform initiatives as a result of the exposure to technology during the pandemic. Rapanta et al. [39] ask “how can this experience help bridge the gap between online and in-person teaching in the following years?”. Rather cautiously, they assume “that the ‘forced’ experience

of teaching with digital technologies as part of Emergency Remote Teaching can gradually give place to a harmonious integration of physical and digital tools and methods for the sake of more active, flexible and meaningful learning". Laufer et al. [21] encourage educational leaders "to move beyond the emergency adoption of online learning towards inclusive, long-term visions for digital education, which emphasize collaboration over individual gain."

Basically, education is facing two options to continue after the pandemic. One perspective relies on the idea of a rollback and implies the return to established routines of teaching and learning before the pandemic. With this view, emergency remote teaching with digital tools is perceived as an exceptional case that will be and can be abandoned when the necessity for education via a distance is over. Many teachers and officials—often implicitly—follow this view of post-pandemic education as a "shift back to normal"—a pre-digital view.

Another view perceives the introduction and extended use of educational technology during the pandemic not only as a temporary "emergency tool" to bridge the distance between teachers and students but as a fast-track to move the educational system into a digital age. Based on evaluations of experiences during the pandemic, this perspective would want to pursue the future of education based on a digital environment—not making learning in a social environment on-campus obsolete but to extend the learning experience with richer opportunities in new approaches to teaching and learning. However, such a view will need to be implemented thoroughly and will need further discussion with teachers and other stakeholders in the fields. We would assume that the increased availability of digital technology will not automatically lead to a larger uptake of new teaching approaches and strategies based on interactive, self-regulated or cooperative learning models. Such models of instructional reform would need the instigation of deeper discussions within educational organizations and the implementation of strategies of proactive change in these institutions.

5. Outlook

Despite a large amount of published research, it is still difficult to grasp a clear picture of the effects of the pandemic on education in the various sectors of education worldwide. Our analysis is not based on a systematic review of research findings on education during the pandemic; our aim has been to investigate research designs of published research on education during the pandemic. We have unraveled the methodological limitations of these approaches and outlined that it is not possible to predict the future of education based on the results of these studies.

Studies on the impact of remote emergency teaching and other measures to cope with the pandemic are important but the reported effects are often difficult to interpret due to a range of methodological issues and constraints. It is not possible to directly attribute the effects of learning with educational technology during the pandemic to the use of EdTech as such since the pandemic has impacted several dimensions of students' and teachers' lives.

These studies have provided much detailed knowledge about the conditions and effects of the use of EdTech during the pandemic, but they are limited with regard to insights on how EdTech can and should support learning in the future. Furthermore, it does seem problematic to extrapolate the future of education in the different regions of the world based on these analyses.

We have outlined a pre- and post-digital view on education after the pandemic—associated with different interpretations of the role of educational technology—and how these views affect current efforts to shape the future of education after the pandemic. A pre-digital *back to normal* as well as a post-digital position striving *for a digital normal* can equally be forecasted and justified based on the current discussions and findings. The direction educational systems will take seems largely open. Zhao [40] points out the "opportunity to rethink education" after the pandemic, but it seems open to what extent the

educational systems will take up this opportunity. In *Nature*, Lockee [41] argues that the pandemic “could permanently change how education is delivered”. Yet, it could—but also could not. As Teräs et al. [34] advise, we will need serious and thorough debates about the future of education and how teaching and learning can be developed to address the challenges of a post-pandemic future.

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