

Worin bestehen die kurz- und langfristigen Herausforderungen und Chancen für soziotechnische Umgebungen, um Lernen, Bildung und Zusammenarbeit im digitalen Zeitalter neu zu erfinden? Die vorgestellten Ideen und Argumente bieten keinen Fahrplan für die Zukunft, da die Planung detaillierter Ziele für eine Welt mit grundlegenden Veränderungen unmöglich ist. Wir hoffen jedoch, dass die Ideen und Überlegungen einen Diskurs bereichern. So könnten die Bedingungen für kulturelle Transformationen geschaffen werden, die eine Krisensituation als Chance für eine andere und hoffentlich bessere Zukunft untersuchen.

Which are the short- and long-term challenges and opportunities for socio-technical environments for rethinking and reinventing learning, education, and collaboration in the digital age? The presented ideas and arguments do not provide a road map for the future because the planning of detailed objectives is impossible for a world experiencing fundamental changes. But we hope that the ideas and reflections will enrich a discourse for creating the conditions for cultural transformations that will embrace and explore a crisis situation as a chance for a different and hopefully better future.

Challenges and Opportunities of COVID-19 for Rethinking and Reinventing Learning, Education, and Collaboration in the Digital Age

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Our Conceptual Framework for the Digital Age

Our research over the last few decades has developed conceptual frameworks and innovative socio-technical environments to envision and rethink *learning, education, and collaboration in the digital age* [Fischer et al., 2020]. Table 1

summarizes some of the exemplary transformations of current practices, their problems, and promising alternatives that we have explored. While digital technologies are necessary to address these objectives, they are not sufficient, Technology alone does not determine social structures nor does it change human behavior: it creates feasibility spaces for new practices.

Established Current Practices	Problems with Current Practices	Promising Future Alternatives
school learning	major learning activities take place outside of and beyond school	focus on lifelong learning and multi-dimensional aspects of learning
unaided human mind	ignoring the power of cognitive tools	integrate knowledge in the head with knowledge in the world
individual human mind	inability to cope with complex systemic problems	support communities and collaboration
standard curricula in formal learning environments	ignoring the interests of learners as encountered in real life	interest-driven learning in the context of personally meaningful problems
learning when the answer is known (by the teacher)	learning when no one knows the answer is required for coping with wicked problems	support collaborative knowledge construction and social creativity
instructionism (information delivery)	information restricted to a one way street from teacher to learner	active contributors in cultures of participation
'gift-wrapping' and 'techno-determinism'	putting old wine in new bottles	co-evolution of learning, media, and learning organizations

Tab. 1: Exemplary Transformations for Learning, Education, and Collaboration

COVID-19: A Turning Point

In early 2020, an unexpected but fundamental event took place: the appearance of COVID-19. In this era, creative thinking has proven to be one of the most important activities. New strategies are required by (1) politicians and health professionals for limiting the spread of the virus, (2) doctors and hospitals for treating patients, (3) researchers and scientists for developing a vaccine, and (4) educational researcher, media experts, teachers, and parents for creating new learning opportunities.

The pandemic is a prime example of a *wicked problem* (Rittel/Webber 1984) with no boundaries. COVID-19 shows the need to deal with unexpected challenges that will arise in today's rapidly changing world where more and more people are faced with unknown, unexpected, and unpredictable situations and 'thinking outside the box' is a necessity. By forcing all

stakeholders to enter uncharted territory, it requires iterative experimentation to gain new knowledge and learn from mistakes. At the same time, it offers unique opportunities addressing real human needs that go beyond productivity, efficiency, and ease of use.

With respect to education, COVID-19 has forced a change in educational practices. The predominant change is to temporarily make distant learning the primary way to provide learning opportunities for people of all ages. Distance learning has long been a part of education (Fischer 2018) — but in the age of COVID-19 it turned into a *necessity* rather than being a *choice*.

The challenges created by coping COVID-19 can be divided into two responses: (1) *immediate actions* in response to the urgency to use distance learning as the primary medium, and (2) considerations and strategies for imagining alternative and innovative ways of learning and teaching of a 'new world' in the digital age impacted by COVID-19.

Short Term: Immediate Action in Response to the Urgency

Large and indefinite partial or full school closings are new territory and are changing the lives and routines of millions of teachers, children and parents. The most pressing activities are: (1) teachers need to engage as lifelong learners to understand the systems that facilitate their distance learning activities; (2) learners have to learn outside of schools (Resnick 1987); and (3) the availability and reliability of the hardware and software to support distance learning must be guaranteed.

After COVID-19 the world will not be what it was before.

In the short term, “*gift-wrapping*” (adding technology to existing processes (Fischer 1998)) is a sensible and appropriate approach that allows teachers to transfer the courses they have taught in a physical classroom to an online environment without major changes. For teaching classes online and remotely, the following developments are urgently needed:

- developing guidelines that go beyond standard practice by *incorporating the lessons learned from relevant research activities* over the past two decades, particularly from (1) community-based learning (Fischer et al. 2007); (2) critical assessments of Massive Open Online Courses (MOOCs) (Fischer 2018); and (3) supporting learning webs as important components of distance education (Illich 1971);
- identifying, developing, and using software and hardware substrates that do not only facilitate the online delivery of lectures, but also support *constructivist activities* (e. g. collaboratively constructed stories, games, and animations with the *Scratch* programming environment and remote versions of digital fabrication laboratories (Resnick 2017));

- complementing the technological challenges with paying attention to *social criteria*, for example by critically monitoring the impact of current practices on the ‘digital divide’ to avoid the widening of the technological gap between school communities.

Long Term: Opportunities to Shape the Learning Environments of the Future

While these short-term measures are critically important for coping with the current situation, the crisis provides a unique opportunity to meet societal demands and challenges of the future. Human societies are not only defined by the conditions to which we are exposed (‘how things are’), no matter how challenging they appear at the moment, but we are defined by the way we react to them (‘how things could or should be’). It is a fair and valuable assumption that after COVID-19 the world will not be what it was before: there will be a ‘new normal’. Crises always offer opportunities for a new beginning and transformation. By emerging from the worst pandemic of our lifetime, we may have a better understanding of more robust online education, better IT infrastructure, and an expanded set of criteria for a more *successful mix* between online and residential education. Going online has also helped us discover or explore pre-existing shortcomings and unfounded assumptions in previous educational configurations (Fischer 2018).

Relevant and Promising Existing Frameworks

While the COVID-19 pandemic is a wicked problem that forces fundamental changes in all areas of life, a few existing frameworks may be of value to explore the challenges and opportunities of COVID-19:

- **Deschooling Society:** Illich (1971) offers arguments on the shortcomings of schools and a critical discourse on institutionalized education. He provides an architecture that enables education to provide the learner

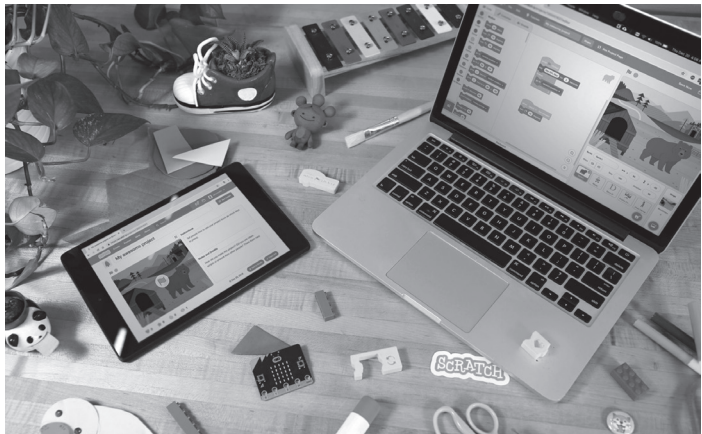
with new connections to the world rather than continuing to direct all educational programs through the teacher.

- **Learning in School and out:** Resnick (1987) explores different aspects "where and how the economic, civic, and cultural aims of education can best be pursued and whether schooling itself should be reorganized to take account of what we are learning about the nature of competence in various aspects of our lives." (page 13)

More specifically: she advocates the importance of creativity and learning when the answer is not known, claiming that education should prepare people for 'breakdowns' (meaning unexpected changes or difficulties that make normal, routine practice inappropriate).

- **Rethinking Education in the Age of Technology:** Collins/Halverson (2009) offer a vision for the future of education by transcending the narrow view of learning taking place primarily in schools. The authors avoid being caught in a hype of the blessings of new technologies but offer a balanced perspective by contrasting the vision of enthusiasts and skeptics with regard to the effects of digital media on learning and education.

- **Scratch — A Success Story of Decentralized Learning and Collaboration:** The research of the *Lifelong Kindergarten* group at the MIT Media Lab (Resnick 2017) has identified four guiding principles for cultivating creativity: projects, passion, peers, and play. These four P's of creative learning are pursued in the context of *Scratch* (a highly successful programming language and online community) and they provide a framework for ways to support children's learning while they are away from school during the coronavirus crisis.



Programs like Scratch can help to overcome the crisis

© Scratch

- **Wicked Problems:** Rittel/Webber (1984) provide an excellent characterization of the nature of wicked problems and create an understanding about COVID-19 being a societal problem with no definitive formulation and no boundaries. It provides ideas and guidelines why learners in today's world should be encouraged and confronted to gain experience in dealing with wicked problems.

Main Objectives and Innovative Aspects of our Research

Digital technologies are changing every aspect of life. As the rate of invention and innovation increases, individuals and societies need to learn to cope with the uncertainty that permeates their experience of novelty, unpredictability, and change. The occurrence of COVID-19 serves as an additional forcing function to rethink what is critical to learn and teach in a complex and changing society. We have tried to understand and exploit the interesting bi-directional relationship between: (1) exploring which of our research themes are relevant to cope with COVID-19, and (2) which of the constraints imposed by COVID-19 can enrich and provide further requirements for future research efforts. This article describes a small number of themes to enrich the conversation for envisioning a



The process of learning is lifelong.

different (and hopefully better) future of education (interested readers can find additional relevant publications at: <https://t1p.de/fischer-publications>).

Change is the only constant

The challenge brought into focus by COVID-19 is how we can prepare ourselves and our children for a world of unprecedented transformations and radical uncertainties. The following thought experiment has served as an example for this challenge in our reflections: a child born in 2015 will start school in 2021 and will retire in the year 2080 (assuming the retirement age will remain somewhat the same). How can we create learning environments that will help young people to acquire mindsets, knowledge, and skills to have personally meaningful lives in the years and decades to come?

Lifelong Learning

The most important approach to cope with change will be to frame and support lifelong learning being more than current models and practices for adult education or training (Fischer 2000). Lifelong learning is a mindset and a habit for people to acquire. Learning can no longer be dichotomized into place and time

to acquire knowledge (school) and a place and time to *apply* knowledge (the workplace). New educational approaches are needed to circumvent the objectives of *coverage* (i. e., trying to teach people everything that they may need to know in the future) and *obsolescence* (i. e., trying to predict what specific knowledge someone will need or not need in the future) which are impossible to solve in today's world and even more in the world of the future. We need to ask what

we should be teaching: (1) *predetermined specific domain skills* (as determined by a curriculum, e. g.: writing computer code in JAVA, Python, or C, solving differential equations, calculating probabilities, etc.), (2) *general purpose life skills* (such as the 'Four Cs': critical thinking, communication, collaboration, and creativity), or (3) the *best possible mix* of the two approaches. We have to create new intellectual spaces, new physical spaces, new organizational forms, and new reward structures to make lifelong learning an important part of human life.

**Teacher, Learner = f{person} → Teacher,
Learner = f{context}**

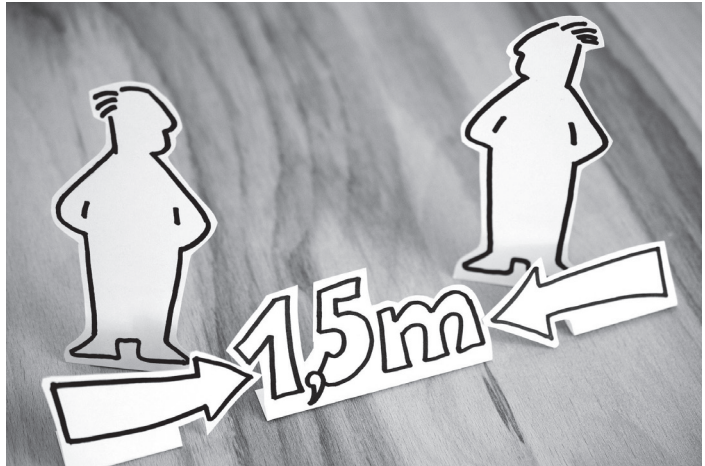
Historically, the role of a teacher or a learner was associated with a person. In today's world, a more promising conceptualization is to associate these roles with specific contexts. It is not unusual that in the digital age students know more about new digital media than their teachers (e. g. in moving teaching and learning into the virtual world in the COVID-19 age, students can advise teachers about new digital platforms for online learning). The students of today are 'digital natives', whereas most teachers are 'digital immigrants' — this role distribution leads to the questionable situation that the immig-

rants are teaching the natives. To reconceive a classroom as an environment of mutual learners requires teachers to change from the 'sage on the stage' to the 'guide on the side'. It requires more engagements from the students but it also makes them feel more appreciated and valued. This change will not be without resistance based on mindsets that students acquire in many years of schooling. This became obvious to us as we taught a course in the 'mutual learners' spirit. The course earned

a bi-polar evaluation by the students based on different mindsets as indicated by very different reactions by two of the students:

■ a negative comment: "I will not ever take a course of this nature again in my undergraduate career, and I hope to find a more structured graduate program with an adviser that is more forthcoming. I will reinforce my strengths by continuing to study in the method that I have developed over the past 15 years. I will redirect my weaknesses by avoiding unstructured class environments"

■ a positive comment: "When I signed up for this class I had no idea what it was going to be about. Once I started understanding the material, however, I was extremely thrilled and interested to be a part of one of the most progressive courses on campus. The self-directed nature of the work ensured that I wouldn't be bored or unchallenged, and the interplay between all of us was a lot of fun. After four and a half years in college, I can honestly say that this is one of the first courses where I was treated as an adult, a fact which means more to me than I can describe."



Instead of 'social distancing', we should rather talk about 'distant socializing'.

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From 'Social Distance' to 'Distant Socializing'

A fundamental challenge of COVID-19 should not be conceived and labeled as 'social distance' (better characterized as 'physical distance') but as creating environments and guidelines that support 'distant socializing' that should examine how people can remain spiritually and socially connected even when they are physically separated. We will expand our previous research on participation cultures (Fischer 2011) by developing a theoretical framework for collaboration by highlighting the design requirements derived from COVID-19. This framework (with an emphasis on distributed constructivist activities) will help to distinguish (1) when collaborative approaches are useful and (2) which types of collaboration are most successful in which situations.

Future Perspective: A Crisis as an Opportunity

Societies, communities and individuals are and will be confronted with an endless stream of unknown, unexpected, and unpredictable situations. The ability to think and act creatively is

more important than ever. The isolation, disruption, and anxiety caused by COVID-19 create challenges and opportunities including:

- rethink and reinvent learning, education and collaboration in the digital age and create opportunities for the 'new normal' after COVID-19;
- support and appreciate mindsets (for educational planners and administrators, teachers, learners, and parents) that are willing and able to cope with wicked problems for which no one knows the answers;
- empower all citizens to cope with an endless stream of unknown, unexpected, and unpredictable situations. While situations like the coronavirus pandemic may be rare, the need to deal with unexpected challenges will not disappear.

It is premature to decide when the COVID-19 restrictions can be relaxed or removed – but it is not premature to develop frameworks and criteria for the 'time after'. It is not too early to start thinking about criteria, challenges, opportunities, and pitfalls as we hopefully emerge in the not too distant future from the worst of the crisis. Therefore, researchers involved in reinventing learning, education, and collaboration should go beyond 'gift wrapping approaches' and examine the co-evolution of learning, new media, and new learning organizations after COVID-19.

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