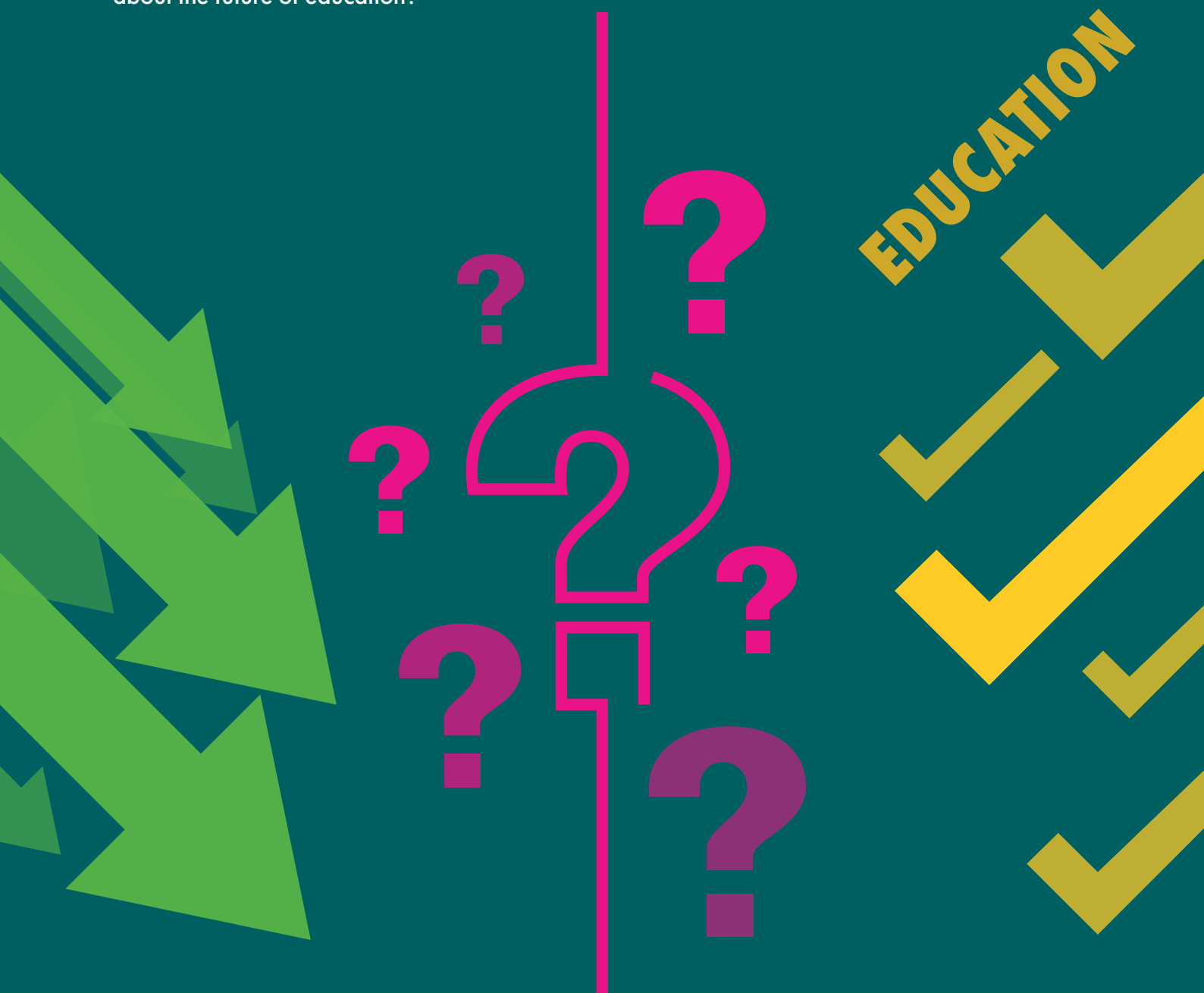


ENGINEERING A SAFER FUTURE

LEARNING FROM CRISIS: FROM DISRUPTION TO TRANSFORMATION

What has the Covid-19 pandemic taught us
about the future of education?





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This report, *What has the Covid-19 pandemic taught us about the future of education?*, is one of a series of related reports and podcasts available at www.lrfoundation.org.uk/en/learning-from-crisis



Summary report



Data



Safety at work



Education



Infrastructure



Public understanding of risk

ABOUT THE SERIES: LEARNING FROM CRISIS

Resilience is the ability to withstand, adapt to changing conditions, and recover positively from shocks and stresses.

The Resilience Shift is committed to understanding how crisis can reveal both the weaknesses and strengths of the systems on which we rely, and to sharing stories and insights across a variety of sectors towards building long-term resilience.

We have investigated the experience of recent crises, bringing together diverse experiences and perspectives across stakeholders to bear witness to the impacts of deeply disruptive events, and the individuals, decisions, technologies and processes that shaped the response and recovery.

*Learning from Day Zero*¹ is a series of film-based learning modules capturing reflections from key individuals involved in the response to the 2017-18 water crisis in Cape Town, South Africa. Developed in partnership with the Cape Town Drought Response Learning Initiative, these modules feature insights curated from over 50 hours of in-depth, filmed conversations with government officials, civil society activists, academics, and business and community leaders.

The *Resilient Leadership*² project is a real-time reflective learning document that captures reflections from city government and corporate leaders navigating their organisations' responses to the Covid-19 pandemic. Through insights distilled from weekly conversations over a 4-month period, the project reveals key attributes of leadership during a crisis and identifies three questions to shape the future of resilient leadership.

*Engineering a Safer Future*³ – insights from which appear in this publication – seeks to explore the impact of disruption and its ability to create a window of opportunity for transformative change. The insights emerged from in-depth expert conversations with senior leaders about the ramifications of the Covid-19 crisis in more detail within specific sectors.

Collectively, these investigations not only strengthen our broad understanding of resilience in practice, but also help us to shape and influence future work. They also actively explore different and innovative approaches to capturing and sharing learning.

1 <https://www.resilienceshift.org/cape-town-learning-from-day-zero/>

2 <https://www.resilienceshift.org/resilient-leadership/>

3 www.lrfoundation.org.uk/en/learning-from-crisis

ABOUT THIS CONVERSATION: EDUCATION

In the *Education* session, held on 16 September 2020, participants were asked to examine how their work life has changed between January and September 2020 due to the Covid-19 pandemic; how they have managed to stay resilient – both personally and professionally – and prepare for a ‘new normal’ future.

The session was a moderated conversation around education changes in a post-Covid world, from small-scale practical issues to long-term consequences to our institutions and systems. The conversation drew on emerging findings from the Foundation’s research as well as input from grant holders and education experts. The session reflected on how Covid-19 has affected education, how the sector has adapted, and what lessons the current disruption holds for our shared future.

ENGINEERING A SAFER FUTURE

At The Resilience Shift, we have long recognised that the past is an increasingly unreliable predictor of the future, and that deep uncertainty around challenge and risk is felt across many sectors. In 2020, the rapid global impacts of Covid-19, and its consequences across every aspect of the work that Lloyd’s Register Foundation supports, provided a unique opportunity for us all to consider the transformations we’d like to see as we emerge from this crisis.

Together, Lloyd’s Register Foundation and The Resilience Shift have developed this series of conversations as an antidote to

the pervasive online ‘noise’ that confronts us as we seek serious discussion and meaningful insight into the ramifications of this crisis. We sought to bring together innovators working within the Lloyd’s Register Foundation’s grant programme, joined by outside subject matter specialists, with the aim of surfacing insights on the likely scale and permanence of changes that Covid-19 has triggered. Our participants also examined how we approach infrastructure systems and interdependencies, and what the pandemic can tell us about our existing preparedness and horizon-scanning practices.

With the five sessions respectively focused on safety at work, data and information systems, education, infrastructure and public understanding of risk, this series explores both the impact of disruption and how disruption can create windows of opportunity for change.

APPROACH AND FORMAT

The closed-door, intimate roundtable format was designed to facilitate fluid interaction amongst a small group of partners, associates, subject matter experts and grantees of the Lloyd’s Register Foundation and of The Resilience Shift. Participants were given latitude to steer the conversation towards their specific sector or area of concern, their experience of challenges, and their thoughts on plausible ways forward.



PARTICIPANTS

ABOUT THE MODERATORS

Dr. Juliet Mian | The Resilience Shift*
Deputy Director

An experienced Civil Engineer of over 20 years' experience working on infrastructure projects both in the UK and overseas, Juliet is a systems thinker who cares deeply about delivering engineering solutions to meet the challenges our planet faces.

Dr. Tim Slingsby | Lloyd's Register
Foundation Director of Skills & Education

Tim is the Director of Skills & Education at Lloyd's Register Foundation.

ABOUT THE PARTICIPANTS

Dr. Rhys Morgan | Royal Academy of Engineering* Director of Engineering & Education

Rhys has responsibility for the diversity work of the Academy, its education policy and research activity and all education programmes, teacher CPD and curriculum resource materials. Rhys also oversees the collaborative education alliances which the Academy hosts; Education for Engineering (E4E), Engineering Council, Engineering UK and Royal Academy of Engineering, and the UK Forum for Computing Education (UKforce), bringing together key organisations in computing education.

Dr. Shervin Maleki | TWI* Director of Global Development

Shervin joined TWI in 2006 and worked for seven years as the Associate Director in Global Training and Technical Services, as well as the Group Manager in Asset and

Fracture Integrity Management before becoming Director of Global Development. Has expertise in risk and reliability engineering, risk assessment, risk-based inspection, and fitness-for-service.

Dr. Kristen MacAskill | University of Cambridge* Lecturer, Department of Engineering

Kristen's research focuses on complexity of decision-making in infrastructure planning and delivery, with an emphasis on disaster risk management. She worked for several years as a consulting engineer in both the water and transport sectors. Her experience covers diverse areas of infrastructure development, including strategic level options assessment, post-earthquake damage assessment, infrastructure design, project management and sustainability assessment.

Dr. Debra Roberts | eThekweni Municipality, Durban Head of Sustainable & Resilient City Initiatives Unit

Prior to her current position, Debra established and managed the Environmental Planning and Climate Protection Department of eThekweni municipality for 22 years and was selected as the city's first Chief Resilience Officer in 2013. Dr Roberts was a Lead Author of Chapter 8 (Urban Areas) and a Contributing Author to Chapter 12 (Africa) of the Working Group II contribution to the IPCC Fifth Assessment Report.

* Lloyd's Register Foundation grant recipient

EMERGING INSIGHTS

The *Education* session focused on both celebrating the innovation and adaptability demonstrated by teachers and educational institutions worldwide in the face of the Covid-19 pandemic, while recognising the increasing sectorwide realisation that the current model for education is broken. The Covid-19 pandemic has provided an inflection moment to consider ways forward that address increasing global digital inequality, lack of standardisation, and how to restore critical social and human components to distanced digital learning.

“Personal relationships are the heart of transferring knowledge. It’s not about what we teach, but what we learn together.”

“We spend so much emphasis on the convergent part of learning, the maths, solving the equations, making sure the bridge doesn’t fall down, but very little in asking if we need a bridge at all.”

EMERGING INSIGHT 1

The amount and pace of innovation and adaptation in education as a response to the Covid pandemic has been unprecedented

Across the education sector, the sheer amount of innovation in response to the Covid-19 pandemic has been both technically impressive and a credit to the adaptability determination of instructors and institutions worldwide.

Classes from elementary education to graduate studios have not merely transitioned to remote digital platforms, but are leveraging and elaborating those platforms to allow meaningful interactivity, multi-learner collaborative projects, and increasingly flexible digital replacements for informal office hours, studio experiences and cooperative learning.

THINGS TO THINK ABOUT:

- What innovative education or training approaches has your sector or education platform developed as a response to the pandemic?
- What approaches have you adopted that can help build agility and flexibility to strengthen your response to other shocks or stresses?

EMERGING INSIGHT 2

Particularly in education, *efficiency* does not automatically mean *effectiveness*

While the rapid shift to online education in response to the Covid-19 crisis represents a technical achievement, many essential qualities of the classroom social experience are often lost in translation. We've rapidly discovered that while online interactions are very efficient, they're also quite transactional.

Learning can be accomplished individually but is most meaningful as a social endeavour. The interplay between students in a classroom or a studio, the give-and-take of a lecture or in-person presentation, and the rewards of collaborative problem-solving are all intangible but crucial to cognitive development. The nature of our current remote technologies means that large parts of the 'spectrum of interaction' are lost, both on the macro (effective multiparticipant conversations, spontaneous social interaction) and micro (body language, eye contact, audio/video lag) levels. Remote individual learning is fundamentally missing a key human component of what makes education work.

THINGS TO THINK ABOUT:

- How can we provide for critical human interaction in remote environments to help students learn social skills in teamwork, communication and creative dynamics in problem solving?
- What mental, emotional and physical health challenges go unseen when interactions in education are only digital?

Research suggests students in grades 1-12 affected by Covid-related closures might expect 3% lower income over their entire lifetimes; for nations, losses might yield an average of 1.5% lower annual GDP for the remainder of the century.⁴

In 2020, the Covid-19 pandemic forced over 1.6 billion learners in over 190 countries out of school at the peak of the crisis, the most severe disruption to global education systems in history.⁵

4 OECD. www.oecd.org/education/The-economic-impacts-of-coronavirus-covid-19-learning-losses.pdf

5 UNESCO. en.unesco.org/news/covid-19-learning-disruption-recovery-snapshot-unescos-work-education-2020

EMERGING INSIGHT 3

The digital divide is accelerating dramatically

The long-term consequences of the Covid-19 pandemic, namely significant increases in poverty, unemployment, and budget reallocation associated with each wave of infections, will sharply accelerate existing technological inequality. Numerous countries have had to slash technical assistance and support around infrastructural considerations in ICT, informal settlements, and transport-oriented development due to economic upheavals, with a corresponding impact on opportunities for upskilling.

Service reductions and resourcing cutbacks across the global south in response to the pandemic have reduced both access to and efficiency of digital tools and networks. Public-assistance programmes implemented around the globe are relieving the acute impacts of the pandemic at the cost of reduced budget availability for digital tools, education and infrastructure into the foreseeable future. As the digital divide accelerates, it renders the global community not merely more inequitable but increasingly vulnerable to the systemic effects of threats beyond Covid-19.

THINGS TO THINK ABOUT:

- What areas or populations within your current scope of operations are likely underserved due to lack of digital access?
- What measures can your organisation adopt to 'reach across' or 'narrow' the digital divide, to maximise future opportunity?

The pandemic has exacerbated well-documented opportunity gaps that put low-income students at a disadvantage relative to their better-off peers. One of the most critical opportunity gaps is the uneven access to the devices and internet access critical to learning online.⁶

⁶ EPI. www.epi.org/publication/the-consequences-of-the-covid-19-pandemic-for-education-performance-and-equity-in-the-united-states-what-can-we-learn-from-pre-pandemic-research-to-inform-relief-recovery-and-rebuilding/



EMERGING INSIGHT 4

Global inequities in technology access put us at severe risk of losing diversity of thought

The aforementioned digital divide isn't just an issue for the technological 'have nots'; as effects of technological inequality compound over time, the cumulative reduction in the voice and presence of the global south will be increasingly severe. Reduction in global travel means a limitation on exposure to different ideas and approaches in ways that digital substitutions for travel may not fully replicate.

In the global north, there is a tendency to assume that the presence of technology implies the presence of systems and resourcing to deploy, maintain and access that technology. In reality, the problems confronting the global south – from rolling blackouts due to overstretched utility grids, government bans on or censorship of commonly used software products and platforms, and insufficient funding for agencies tasked with deployment and standardisation – mean that simply having access to a smartphone, a laptop or the internet is no guarantee of being able to meaningfully or effectively participate in global digital systems for communication, education or trade.

This 'minimisation of digital presence' has severe consequences not only for the local individuals and organisations directly affected, but for our global ability to draw on the full strength of worldwide scientific ability and statistical inclusion in responding to future crises of Covid scale and beyond.

THINGS TO THINK ABOUT:

- What are some assumptions that your organisation or sector has made about the access to or resourcing for technology in other global regions? What implications do these assumptions have for your work?
- What measures can your organisation adopt to ensure that culturally and regionally diverse voices are represented in your sector, to avoid missing important contributions and innovation?

[In the US] The cumulative learning loss could be substantial, especially in mathematics—with students on average likely to lose five to nine months of learning by the end of this school year. Students of colour could be six to 12 months behind, compared with four to eight months for white students.⁷

⁷ McKinsey & Company. www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-and-learning-loss-disparities-grow-and-students-need-help#

PRIORITY ACTIONS / KEY TAKEAWAYS

KEY TAKEAWAY 1

Holistic and ongoing learning is increasingly essential

The Covid-19 pandemic has underlined the liabilities of our increasingly specialised education pipelines. Crises clearly require not just subject specialists but a population and a workforce that can creatively interoperate across disciplines. A diversity of skills and backgrounds will be crucially important for our global response to future disruptions.

Achieving this will require not merely teaching in a more multi-disciplinary way but also reshaping our thinking about what education should be, particularly in STEM disciplines. Broadening curricula towards an engagement with the arts, humanities and social science will ensure the future workforce has not just the technical acumen but historical perspective, creative thinking skills and understanding of social psychology necessary to effectively respond to similar disruptions.

KEY TAKEAWAY 2

Intangibles of the classroom experience are vitally important to learning

Current trajectories of remote learning and online coursework run the risk of distilling education to a purely solitary and transactional experience, and thereby losing the enormous social, cooperative and experiential benefits of the classroom or lecture experience.

Further development of digital education systems and platforms should consider this, and direct innovation towards enabling these intangible social components as well as increasing efficiency.



KEY TAKEAWAY 3

Global standards for education outcomes can help better distribute opportunity

Professional bodies have long had international accords that define expected output standards from technical education. Universities and other educational institutions could greatly benefit the global knowledge pool by adopting similar standards. This would serve to distribute opportunity more equitably, and could open access to education by reducing or eliminating the burden of location.

The pandemic has provided a window in which to rethink our habitual approaches to education access and the role of a global university in the world. This represents a rare chance to establish international standards that could work to close the educational divide, reinforce the importance of interdisciplinary work and humanities curricula, and move towards levelling access to top-tier educational programmes worldwide while imparting resilience skills and thinking on a broad basis.

KEY TAKEAWAY 4

'Technology access' is not enough; understanding the factors limiting that access is key to an equitable education future

It's clear that moving forward from the Covid crisis, education is likely to become increasingly remote and dependent on technology. To both ensure that technologically-capable populations benefit from the most robust adaptations of the social classroom experience, and to prevent technologically compromised populations from falling further behind, we must rigorously challenge our assumptions about technology and access.

As an example, during the conversation documented in this report, while all participants were using the same videoconferencing hardware and software, four participants were physically located in northern Europe and one in South Africa. Due to infrastructure and bandwidth issues, the participant located in South Africa reported "only hearing every fourth sentence" of the discussion. This illustrates the risks inherent in assuming that 'access' means 'engagement'.

Building holistic side-channels into educational platforms to enable cooperative learning and investing in the resourcing and systemic support necessary to broaden access in the global south should be key priorities for forthcoming educational technology projects.

ABOUT LLOYD'S REGISTER FOUNDATION

The Lloyd's Register Foundation seeks to secure for the benefit of the community high technical standards of design, manufacture, construction, maintenance, operation and performance for the purpose of enhancing the safety of life and property at sea, on land and in the air.

The *Engineering a Safer Future* programme is designed to focus on sharing existing experience and knowledge within and between sectors, and forms an important part of the delivery of our strategic theme accelerating the application of research.

The Lloyd's Register Foundation's programme supports resilience, by addressing:

- Governance: incentives, standards, rules, legal and financial
- Capacity building and engagement: professional development, publications, communication and public engagement
- Data and supporting tools: shared datasets, modelling and simulation, decision support
- International and global scale networks: studies of global systems, supply chains, knowledge networks.

ABOUT THE RESILIENCE SHIFT

The Resilience Shift is a catalyst for positive change. We seek to inspire and empower a global community to make the world safer through resilient infrastructure. Our mission is to help ensure the safety and continuity of the critical infrastructure and services that make our lives possible. From water and transportation to communications and energy, resilience is essential to everything we do. We're working globally to help define resilience and provide pathways from theory to practice.

Supported by Lloyd's Register Foundation and Arup, The Resilience Shift provides knowledge and tools to those responsible for planning, financing, designing, delivering, operating and maintaining critical infrastructure systems. We are not just a think tank, not just a grant-making body, and not just a convening network. Our impact is achieved through a proactive approach combining all three of these roles.

The Resilience Shift's approach is through learning by doing in collaboration with others, as well as by sharing knowledge and fostering a global community. We want to create value for those we are seeking to influence, thereby maximising the positive impact for society. We focus on tools and approaches to put this shift in resilience thinking into practice, identifying the drivers and enablers for infrastructure resilience, and advancing a common understanding of resilient systems, within and between critical infrastructure sectors.

THE RESILIENCE SHIFT

www.lrfoundation.org.uk/en/learning-from-crisis



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