

Digital Transformation of Higher Education



Global Learning
Report 2021



Preface

COVID-19 proved to be a major disruption in the lives of individuals around the world, and simultaneously served as a driver for change. Practices and systems across all sectors have been and continue to be overhauled—including the higher education system.

For many years, higher education thought leaders have sought to adopt digital learning with the goal of providing more access to quality education. This effort is in line with the United Nations Sustainable Development Goal for Education, which calls for inclusive and equitable quality education and lifelong learning opportunities for all.

The rapid digital shift to distance teaching in the context of the global pandemic gave new impetus to the discourse in higher education to address digital teaching and learning. As a result, questions around the value of teaching, barriers to equitable educational access, and guardrails needed for sustainable digital transformation became pressing concerns.

We—the Global Learning Council, the German Academic Exchange Service, and Times Higher Education—have each been monitoring this shift over the past 16 months. In search of answers to these pressing concerns, we have initiated research projects that have allowed us to bring forward the voices of educators and higher ed leaders, and to develop recommendations for a digital education transformation. We believe there is a window of opportunity to use the learnings of the past months to enable lasting and meaningful change for the higher education sector.

As this report shows, the moment of crisis triggered by the COVID-19 pandemic has been able to accelerate critical aspects of this change, but has also provided a clearer picture of areas where urgent action is needed. While we understand these to be universal challenges to digital learning that affect us all, solutions for these areas need to be contextually adaptive, depending also on different educational cultures around the world. As part of this report, experts of higher learning have therefore reflected more deeply on the areas of higher education governance, digital skills training, and equitable access. Our findings also show that collaboration is key to success in the competitive global higher education system.

This report is intended to enable all higher education stakeholders—education institution leaders, industry leaders, and policymakers—to recognize the global momentum and use the recommendations provided to embrace the challenge. In the spirit of collaboration, let us work together to improve education for all learners around the world.



MATTHIAS KLEINER
Chair of the Global
Learning Council (GLC),
President of the Leibniz
Association



FRIEDRICH W. HESSE
Scientific Co-Chair
of the Global Learning
Council (GLC)



JOYBRATO MUKHERJEE
President of the German
Academic Exchange Service
(DAAD)



JOHN GILL
Editor of Times Higher
Education (THE)

Imprint

The **Global Learning Council** (GLC) is a virtual organization that brings together thought leaders in the effective use of technology to provide access to education and improve learning outcomes worldwide. Founded in 2013, the GLC offers a platform to connect educators, organizers, and innovators from academia, industry, and the non-profit sector to foster cooperative processes and advance innovative strategies for digital learning.

The **German Academic Exchange Service** (Deutscher Akademischer Austauschdienst, DAAD) is the world's largest funding organization for international academic cooperation and the international exchange of students and researchers. Its members are German institutions of higher education and their student bodies. The DAAD's presence in more than 100 countries worldwide serves as the basis of its international expertise.

Times Higher Education (THE) is a leading source of information about global higher education, that showcases perspectives from across academia, governments, and industry. With a deep understanding of the higher education sector, THE provides access to news and analysis, data, university rankings, and forums for debate. On the THE Campus platform, academics can also find and share advice on digital teaching and learning.

© July 2021

This work is licensed under CC BY-ND 4.0. Quotation permitted.

RECOMMENDED CITATION

Global Learning Council (2021). Digital Transformation of Higher Education—Global Learning Report.
DOI: 10.21241/ssoar.73580

PUBLISHER

Global Learning Council c/o Leibniz Association
Christian Kobsda
Chausseestr. 111 · 10115 Berlin · Germany

AUTHORS

Sara Custer (Times Higher Education), Bronwen Deacon (Alexander von Humboldt Institute for Internet and Society), Lauren Herckis (Carnegie Mellon University), Friedrich W. Hesse (Global Learning Council), Michael Hörig (German Academic Exchange Service), Jan Kercher (German Academic Exchange Service), Alexander Knoth (German Academic Exchange Service), Naomi Knüttgen (German Academic Exchange Service), Christian Kobsda (Global Learning Council), Anne Leiser (Global Learning Council), Volker Meyer-Guckel (Stifterverband), Bitange Ndemo (University of Nairobi), Bror Saxberg (Chan Zuckerberg Initiative), Karen Vignare (Association of Public and Land-grant Universities), Dagmar Willems (German Academic Exchange Service)

CONTRIBUTORS

Benedikt Fecher (Alexander von Humboldt Institute for Internet and Society), Melissa Laufer (Alexander von Humboldt Institute for Internet and Society), Tan Eng Chye (National University of Singapore), Erle Lim (National University of Singapore), Paola Perrin de Bri-chambaut (Alexander von Humboldt Institute for Internet and Society), Carl Wieman (Stanford University)

EDITORIAL TEAM

Friedrich W. Hesse (Global Learning Council), Christian Kobsda (Global Learning Council), Anne Leiser (Global Learning Council)

PROJECT COORDINATION

Anne Leiser (Global Learning Council)

ART DIRECTION AND COMMUNICATION

Marlen Sommer (Global Learning Council)

DESIGN AND LAYOUT

Novamondo GmbH

This publication was funded by the Federal Ministry of Education and Research (Germany).

SPONSORED BY THE



Federal Ministry
of Education
and Research

Table of Contents

Executive Summary	05
1 Introduction	07
2 Overview of Findings	08
2.1 About the Research	08
2.2 Digital Teaching and Learning	08
2.3 Crisis Response to the Pandemic	10
3 Areas of Action	13
3.1 Equitable Access	15
Access as a Key Challenge	15
The Necessity to Modernize Infrastructure	16
Toward a Research-Based Approach	16
Integration of Systematic Change Management	17
3.2 Institutional Digital Transformation	18
Anchoring Digitalization at the Institutional Level	18
Institutional Strategy for Digitalization	19
Institutional Support for Digitalization	20
Institutional Culture for Digitalization	20
Institutional Commitment to Diversity, Equity, and Inclusion	21
3.3 Digital Literacy	22
Digital Divide and Uneven Digital Literacy	22
Digital Literacy and Pedagogical Competencies	23
Digital Learning in a Time of Crisis	24
Combating the New Digital Divide	25
3.4 Virtual Collaboration	26
Mobility Remains, Mobility Patterns Change	26
Toward New Forms of Mobility	27
Collaboration as the New Currency	28
Virtual Internationalization and Collaborative Learning	29
Co-Creation is Key for Innovation	30
4 Recommendations	31
4.1 Leadership: Digital Learning Transformation at the Institutional Level	31
4.2 Policy: Digital Learning Transformation at the Nation-State Level and Beyond	32
4.3 Industry: Responsible Technology Innovation for Digital Learning	33

Executive Summary

If, as argued by *The New York Times*, 2012 was the year of massive open online courses (MOOCs), then 2020 must undoubtedly have been **the year of the online classroom**. The difference between the ambitious vision for mass online higher education's potential and the reality of online education at most universities during the COVID-19 pandemic is stark. This disparity reveals the two-speed progression toward complete digital transformation within institutions before the pandemic began: while some had embraced digital learning and were devising groundbreaking ways to teach online, others were slow adopters—if, indeed, they had adopted digital learning at all.

This realistic assessment does not intend to discount the monumental accomplishments many higher education institutions (HEIs) have made in the past year. Rather, with this report, we aim to tap into that ambitious spirit and question how we can **take this moment as an opportunity** to improve digital learning for all students by identifying some key action points and providing recommendations for higher education leaders, policy makers, and ed tech industry partners.

To set the scene, we have **consolidated data from several surveys** about higher education leadership, digital teaching, and internationalization conducted during the pandemic. These surveys provide a cross-section of perspectives from higher education faculty and leaders during the shift to online education in 2020. The data also present forward-looking views adopted during the response to the crisis and offer insight into future developments.

The findings from these data reveal that inequalities impeding learning run much deeper than many of us had previously recognized. Moreover, they remind us that for digital learning to occur at our institutions, a digital transformation process must take place across all levels and with full support for instructors and teaching staff. Collaboration, which was an exceptional asset during the pandemic, must be seen as fundamental to this digital transformation process. While international student mobility suffered during the crisis, students still exhibit a strong inclination to study abroad, albeit via new, alternative forms of student mobility.

The subsequent sections of this report are organized around areas of action that we deem crucial steps in providing students with the best possible digital education.

The first area of action our report addresses is **equitable access to education**. While the digital divide remains a factor in inequality, we argue that institutions can plan for this and other constraints through strategic decisions that fall under digital transformation. The digital transformation of teaching and learning requires a robust understanding of the impactful and planned use of digital infrastructure and pedagogies. Digital transformation allows institutions to reach more students (i.e., improve access) and enhance success. Learning sciences can be applied in a digital infrastructure that enables educators to identify students at risk much sooner than would be possible through traditional methods. Institutions can also function as change makers in the lives of their students by adopting open education practices, including the use of open educational resources (OERs) and open pedagogies. The use of digital tools such as OERs can be more powerful when delivered through a digital infrastructure that focuses on ensuring equitable success through learning sciences.

The second area of action highlighted in our report is **institutional digital transformation of HEIs**. The objectives and strategies of this transformation must be clearly formulated and communicated widely and effectively to all stakeholders at each institution. A solid understanding of what digital transformation means is essential, as is an

incentive structure to encourage teachers to develop innovative teaching methods. Contrary to public opinion that online learning is less expensive than face-to-face instruction, institutional digital transformation requires significant investments. The development of technical learning infrastructures should be a central task of strategic higher education management. Meanwhile, the precarity of the academic workforce also remains a barrier to digital transformation. Academics on short-term or zero-hour contracts must rely on their own devices, internet access, and proficiencies in pedagogy and digital technology. The economic insecurity and mobility of these educators further limit access to social support and necessary resources, and adequate institutional support for all faculty members to master novel digital technologies and pedagogies is often lacking.

Third, the need for a high level of **digital literacy among teachers and students** cannot be underestimated in successful digital higher education. However, both students and lecturers face clear barriers to developing digital literacy skills. For example, educators often fail to recognize the digital divide among their students, expecting them to utilize digital tools in the learning process even when these students may be ill-equipped to engage with those tools. In addition, although they possess a deep knowledge of their field, lecturers often lack the specialized pedagogical skills needed to teach effectively using digital tools and technologies, while many HEIs do not work to mitigate existing digital divides through digital literacy development strategies.

Finally, we assert that **virtual collaboration is the new currency** of higher education. The pandemic has underscored the imperative of addressing global issues in a collaborative manner. Virtual collaboration offers numerous opportunities to increase educational access and inclusivity, reduce operational costs, create less hierarchical communication structures, and modernize existing infrastructures and processes. Most importantly, virtual collaboration can foster more meaningful and more sustainable exchanges among both students and academics. International exchange among academics is not predominately about traveling from place A to place B but about working together to achieve common goals. Similarly, for students, virtual collaboration can capitalize on and expand the internationalization of the curriculum and internationalization at home approaches. Collaborative attitudes toward internationalization also further enable innovation in learning and teaching through open educational practices.

We conclude our report with **recommendations for HEIs, policy makers, and industry partners**.

First, we urge HEIs to digitally transform themselves through iterative, participative processes; to make equitable learning their mission; to hone their digital leadership skills; and to tap into the wealth of knowledge available in the underused learning sciences.

Second, we recommend that policy makers and governments provide learning infrastructure and technology across systems and regions; tackle systematic inequalities at all levels; create strategies for digital literacy programs; and support open educational approaches.

Lastly, we propose that our ed tech industry partners work responsibly, ethically, and transparently to design educational technology in accordance with what we know about human learning; design business models aligned with open education; and make technology regionally and individually accessible.

1 Introduction

The year 2020 brought drastic changes to the higher education landscape, the long-term consequences of which we will experience and come to fully understand only in the years to come.

The COVID-19 crisis has illuminated and deepened myriad inequities. At the same time, the vast majority of HEIs worldwide have continued to deliver educational experiences to learners.¹ The new practices, structures, and paradigms that have shaped the past year **promise to radically transform** the global landscape and offer a pathway to combating the new digital divide.

We intend to use this momentum to contribute to discussions regarding higher education by asking the following questions: What are the universal challenges surrounding learning, especially digital learning, and what solutions can **higher education leaders of all sectors** implement to improve learning for all?

This report examines the **long-term challenges to learning** in general and digital learning more specifically and contextualizes them in the immediate crisis response and ongoing shift toward sustainable digital learning strategies. The study builds on academic and experiential knowledge from scholars and educators and integrates data-driven findings and practical examples. It focuses, moreover, on solutions at the leadership level that are globally relevant but regionally and culturally adaptive, and it highlights perspectives from various sectors, aiming to bridge divides between the critical but as yet fragmented conversations about digital learning, the sciences of learning and development, digital leadership, global collaboration, and technological innovation. The **goal is to empower change makers** of higher education and higher education systems to recognize problems in their own contexts and identify solutions that capitalize on what we know about learning and development as well as the affordances of technology today.

1 — Marinoni, G., van't Land, H., & Jensen, T. (2020). *The impact of Covid-19 on higher education around the world*. IAU Global Survey Report. Retrieved from <https://www.iau-aiu.net/Covid-19-Higher-Education-challenges-and-responses>

2 Overview of Findings

2.1 About the Research

The findings in this report are based on studies conducted in 2020 by the Global Learning Council (GLC),² Times Higher Education (THE), and the German Academic Exchange Service (DAAD).

The **GLC Study**, which was conducted from May to November 2020, surveyed 85 higher education leaders from all world regions. The study aimed to understand whether rapid digital transformation evoked positive and sustainable developments for digital teaching and learning at HEIs worldwide. Through in-depth interviews, the study offered further insight into leadership positions and context-specific factors that contribute to digital learning strategies.³

The **THE Leaders Study**, which was conducted in May 2020, surveyed 200 university leaders from 53 countries. With a focus on the COVID-19 pandemic, the study explored primary concerns as well as differences in these concerns by region and system.⁴ The **THE Digital Teaching Survey**, meanwhile, was completed by 520 respondents from 46 countries between October and November 2020. It examined the extent to which instructors' and senior managers' transition to online instruction was successful.⁵

The **DAAD Survey** was disseminated among the international offices of German universities from April to May 2020 to explore the impact of COVID-19 on international student mobility in Germany. It comprised 173 respondents and focused on both actual and presumed effects of COVID-19 on teaching, the implications for international student mobility in Germany, and the situation of international and domestic students in the country.⁶

To provide a comprehensive overview, we also draw on other sources, such as reports and literature from the learning sciences and the higher education field.

2.2 Digital Teaching and Learning

A central premise of digitalization is that it enables broader access to information and more widespread participation in the knowledge society. In theory, then, digital tools also afford greater access to education and provide more learners with opportunities to partake in higher education in ways that are customized to each learner's context and capabilities. Expectations for digital learning have, therefore, always highlighted the promise of creating **increased access to quality education**.

With MOOCs emerging in 2008 and coming into full force several years later, a conversation developed regarding technological disruptions to the higher education landscape. For students, the introduction of digital technologies in learning environments initially presented the opportunity to access courses at exclusive institutions at reduced costs. Today, many scholars agree that the most important disruption caused by MOOCs relates less to the technology or pedagogy and more to the **cultural changes around open education**. As Ebner, Schön, and Braun point out, open licenses for MOOC resources provide the mechanism for potential innovation around open learning and teaching scenarios.⁷

In practice, however, inequalities in education have persisted as access to education is affected by the unequal distribution of resources within society and, in part, by diverse student capacities and motivations within different communities. The term "digital

2 — The GLC Study was undertaken together with researchers from the Alexander von Humboldt Institute for Internet and Society.

3 — Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (in press). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *Journal of Educational Technology in Higher Education*. DOI: 10.1186/s41239-021-00287-6

4 — Jump, P. (2020). *THE Leaders Survey*. Retrieved from <https://www.timeshigher-education.com/features/leaders-survey-will-covid-19-leave-universities-intensive-care>

5 — Jump, P. (2021). *THE Digital Teaching and Learning Survey*. Retrieved from <https://www.timeshighereducation.com/campus/download-digital-teaching-survey-special-report>

6 — Kercher, J. & Plasa, T. (2020). *COVID-19 and the impact on international student mobility in Germany: Results of a DAAD survey conducted among international offices of German universities (Working paper)*. Retrieved from https://static.daad.de/media/daad_de/pdfs_nicht_barrierefrei/der-daad/analysen-studien/daad_2020_covid-19_and_the_impact_on_international_student_mobility_in_germany.pdf

7 — Ebner, M., Schön, S., & Braun, C. (2020). More than a MOOC—seven learning and teaching scenarios to use MOOCs in higher education and beyond. In S. Yu, M. Ally, & A. Tsinakos (Eds.), *Emerging technologies and pedagogies in the curriculum* (pp. 75–87). Springer. DOI: 10.1007/978-981-15-0618-5_5

divide,” coined in the late 20th century, traditionally refers to social inequality between those individuals who have **access to the basic infrastructure** necessary for digital learning, such as computing devices and the internet, and those who do not.⁸ Nevertheless, this term can be expanded to include the academic and non-academic differences that learners and their communities bring to their experiences with digital learning even when the raw infrastructure is available. This **gap is driven by structural inequalities** inherent in geodemographic variables, such as location, income, age, race, or gender.⁹

With the proliferation of technological infrastructure, barriers to accessing devices and broadband have been reduced, yet accessing the benefits of education remains challenging. The definition of the digital divide has thus widened and today encompasses the appropriate use of digital learning tools, or digital literacy, by and for specific communities of learners. Digital literacy (also referred to as digital skills or digital competency) **helps learners achieve positive learning outcomes** in digital environments but is nonetheless affected by underlying structural inequalities.¹⁰ Notably, these differences exist not only between students but also between students and faculty.¹¹ As a result, faculty may not always be equipped and prepared to adequately promote and develop students’ digital information literacy skills and, more generally, their digital learning.¹²

Various factors determine **whether or not technologies bring improvements** for learning processes and learning outcomes. The use of digital teaching and learning technologies can enable new modes of learning (e.g., blended learning, flipped classrooms), the redesign of curricula, and the reconceptualization of learning outcomes (e.g., learning outcomes aligned with 21st-century skills and digital literacy enabling self-directed learning). Computer-supported collaborative learning (CSCL) can enhance the social learning experience even when students are not in the same place.¹³ Finally, individualized, flexible education that considers what a learner and their community cares about and knows deeply can increase motivation to learn.¹⁴

Indeed, beyond digital tools and their appropriate implementation, digital learning must address students’ individual needs if it is to improve learning outcomes. **Factors that contribute to enhanced learning** include an understanding of each learner’s basic skills, deliberate efforts to foster a sense of belonging and self-efficacy, a growth mindset, linkages to prior knowledge, motivation, cultural sensitivity and competence, and the individualized design of lessons and curricula.¹⁵ Thus, taking into consideration appropriate digital pedagogy grounded in the evidence we have now about learning and motivation, digital learning can provide vast benefits to learners.

The last 20 years have demonstrated that **devices and broadband alone cannot solve problems of educational access**, nor can they allow students and educators to reap the benefits of digital approaches. Similarly, it is not the introduction of educational technology per se that is the recipe for success in improving learning experiences and outcomes but rather a trained and conscious use of it, consistent with what we know about learning, development, and motivation. Digitalization can thus be understood as an amplifier, but it does not change the fact that poor-quality teaching does not become better when delivered digitally. Current technological developments have opened new avenues for education, entailing tools that allow for new learning modes and digitalization as a key component for HEIs to experiment with new business and learning models and, in turn, rethink access to information and participation in the knowledge society. The digitalization process must, therefore, be accompanied by a **widespread cultural change** in the learning environment as well as investment and continuous improvement in the digital literacy of all stakeholders.¹⁶

8 — Garcia, A. & Lee, C. H. (2020). Equity-centered approaches to educational technology. In M. J. Bishop, E. Boling, J. Elen, & V. Svihla (Eds.), *Handbook of research in educational communications and technology* (pp. 247-261). Springer

9 — Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.

10 — Ritzhaupt, A. D., Cheng, L., Luo, W., & Hohlfield, T. N. (2020). The digital divide in formal educational settings: The past, present, and future relevance. In M. J. Bishop, E. Boling, J. Elen, & V. Svihla (Eds.), *Handbook of research in educational communications and technology* (pp. 483-504). Springer. DOI: 10.1007/978-3-030-36119-8_23

11 — Adedoyin, O. B. & Soykan, E. (2020). Covid-19 pandemic and online learning: The challenges and opportunities. *Interactive Learning Environments*, 1-13. DOI: 10.1080/10494820.2020.1813180

12 — Santos, A. I. & Serpa, S. (2017). The importance of promoting digital literacy in higher education. *International Journal of Social Science Studies*, 5, 90-93. DOI: 10.11114/ijsss.v5i6.2330

13 — Chen, J., Wang, M., Kirschner, P. A., & Tsai, C. C. (2018). The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis. *Review of Educational Research*, 88, 799-843. DOI: 10.3102/0034654318791584

14 — Clark, R. C. & Mayer, R. E. (2021). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). John Wiley & Sons.

2.3 Crisis Response to the Pandemic

The pandemic situation and response necessitated an unprecedented shift to online teaching. As is evident from the previous chapter, the field of learning science possesses thorough knowledge of many aspects of digital teaching and learning. However, the sudden introduction of emergency remote teaching brought new realizations of what happens when HEIs cannot adequately prepare for digitalization. Studies conducted in 2020, including those by the GLC, the DAAD, and THE, **reveal the bottlenecks** of digital teaching and learning. A synthesis of these studies produces a number of key findings, discussed in detail below.

Key Finding: Inequalities impeding learning run more profoundly and expansively than previously thought.

Inequalities include access to technological infrastructure, learning experiences that do not connect with communities' or learners' goals or experiences, challenging home-learning environments, food insecurity, and mental health issues. Although some of these inequities reflect obstacles that were already being discussed prior to 2020, the COVID-19 pandemic highlighted the persistence of many ongoing challenges while giving rise to several new ones.

In the GLC Study, respondents describe how **inequalities at the individual and institutional level are interwoven**. Critical inequalities include access to stable infrastructure and further technical resources, such as devices, software, and licenses, as well as digital competencies. In addition, home environments have become more precarious, with domestic abuse and violence rising and many individuals, particularly women, burdened by additional care responsibilities. Finally, both students and instructors are affected by systemic inequalities.

Key Finding: Faculty and teaching staff require institutional support in moving their teaching online.

Since most HEIs were not adequately prepared for the rapid digital shift effectuated by the pandemic, the **quality of online teaching failed to meet the standards** of in-person teaching. Academic assessment and academic honesty, which become more difficult to monitor when education takes place remotely, posed immediate challenges. The larger problem, however, is the question of how to assess—remotely or otherwise—both the academic and non-academic progress of students from different communities and backgrounds who bring diverse interests and identities into the learning environment.

The studies conclude that developing **instructors' technical skills and their understanding of student learning and motivation** must be at the heart of any strategy to introduce new teaching models. Support for these efforts from the respective HEIs is also imperative. By and large, respondents to THE's Digital Teaching Survey reported receiving some support from their institutions in developing their online teaching: 51 percent of respondents agreed or strongly agreed that their universities actively helped them improve their online teaching skills in the months following the initial digital switch, while 35 percent did not.

Teacher training, which can be an additional burden on already busy academic staff, must be deemed valuable. Before the outbreak of the pandemic, many had little to no experience with digital teaching technologies and online teaching consistent with learning and development science. Universities, therefore, had little prior knowledge to build upon in their institutional response, and solutions were determined by individ-

15 — Cantor, P., Osher, D., Berg, J., Steyer, L., & Rose, T. (2019). Malleability, plasticity, and individuality: How children learn and develop in context. *Applied Developmental Science, 23*, 307–337. DOI: 10.1080/10888691.2017.1398649

16 — Englund, C., Olofsson, A. D., & Price, L. (2017). Teaching with technology in higher education: understanding conceptual change and development in practice. *Higher Education Research & Development, 36*, 73–87. DOI: 10.1080/07294360.2016.1171300

Fischer, G., Lundin, J., & Lindberg, J. O. J. (2020). Rethinking and reinventing learning, education and collaboration in the digital age—from creating technologies to transforming cultures. *The International Journal of Information and Learning Technology, 37*, 241–252. DOI: 10.1108/IJILT-04-2020-0051

ual needs. This imposed **additional pressure on faculty and teaching staff**, 89 percent of whom reported an increase in their professional workload after the move to online teaching. In the THE Digital Teaching Survey, more than half of the respondents indicated that the initial shift to online teaching had negatively affected their mental health.

Key Finding: A digital transformation process must occur across all levels of HEIs to implement digital learning.

During 2020, responses from HEIs primarily entailed individualized ad-hoc solutions. To solve access issues, universities provided devices, broadband, and software to students who did not have their own. Some turned to creative solutions, establishing public-private partnerships to furnish students with data packages, while others created Wi-Fi hotspots that students could access by car in campus parking lots. In addition to equipment, support was also offered via 24/7 IT help desks, intensified communication with individual students, and new ways of organizing teaching, such as the introduction of mini semesters.

The experimentation of 2020 sparked new conversations about how to move **toward sustainable models of digital learning**. Many agreed that implementing digital learning does not merely require a switch to online formats but warrants, instead, strategies and leadership geared specifically to implementing technology-enhanced learning and digital transformation at HEIs. Accompanying this transformation must be an open mindset fostered at all levels of the educational institution.¹⁷

Key Finding: Collaboration emerged as a fundamental element of the transformation process.

In 2020, collaboration within and between HEIs became widely evident as stakeholders exchanged best practices, shared resources, and discussed new ideas about how HEIs could collaborate in the future. Particularly at the beginning of the crisis, many institutions were unable to react quickly and flexibly enough, which is why many **instructors relied on informal support structures** to prepare for digital teaching. Higher education leaders and administrators also turned to existing networks, such as university associations, to share experiences and resources.

By building a culture of sharing and establishing collaboration in higher education as the norm, we will be able to profit from the advances of open education to ensure that all learners enjoy equitable access to high-quality teaching.

Key Finding: Demand is increasing for HEIs to provide alternatives to traditional student mobility.

Internationalization and student mobility suffered in 2020, compounding the strain on institutions—particularly in marketized systems. The financial impact of **decreased international enrollments** due to the pandemic was a central concern. Especially in marketized systems, universities' economic sustainability relies considerably on international students.

Different predictions have been offered regarding the future of internationalization at HEIs. For instance, in one study, more than 60 percent of respondents forecasted that students' interest in international study would decline for the next five years.¹⁸ By contrast, in Germany, which is not a marketized but a public system, more than half of HEIs expect that the **importance of internationalization will remain largely the same** as a result of the COVID-19 pandemic; instead, they predict a rapid recovery of inter-

17 — Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (in press). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *Journal of Educational Technology in Higher Education*. DOI: 10.1186/s41239-021-00287-6

18 — Jump, P. (2020). *THE Leaders Survey*. Retrieved from <https://www.timeshigher-education.com/features/leaders-survey-will-covid-19-leave-universities-intensive-care>

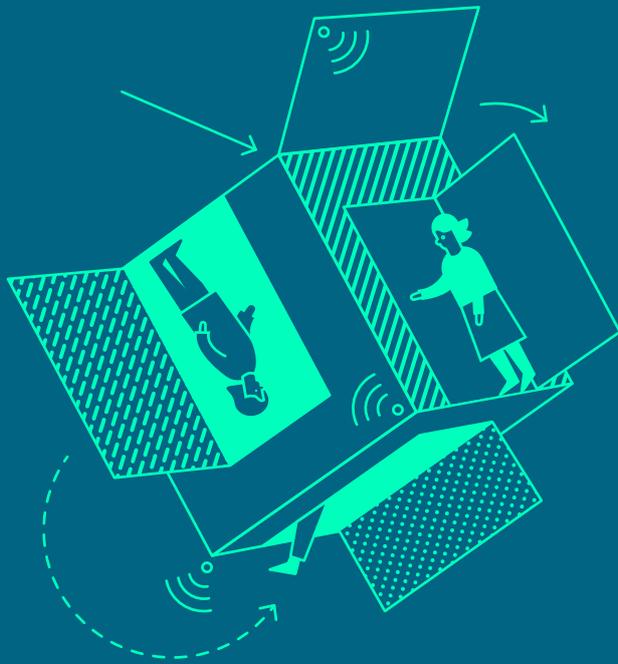
national students' (physical) mobility to its previous level after the pandemic-related travel restrictions are lifted.¹⁹

Nevertheless, virtual mobility may provide a more equitable approach to student mobility. First, it can even the playing field as it opens opportunities for students who may not be able to afford to participate in traditional international mobility schemes. Second, it may help combat the unidirectionality of student mobility that some have lamented as creating brain drain for less renowned institutions. Finally, as collaboration has emerged as a key characteristic of HEIs' crisis response, a continuing focus on international collaboration may allow HEIs to pool critical teaching resources.

19 — Kercher, J. & Plasa, T. (2020). *COVID-19 and the impact on international student mobility in Germany: Results of a DAAD survey conducted among international offices of German universities* (Working paper). Retrieved from https://static.daad.de/media/daad_de/pdfs_nicht_barrierefrei/der-daad/analysen-studien/daad_2020_covid-19_and_the_impact_on_international_student_mobility_in_germany.pdf

3 Areas of Action

Based on the key findings outlined above, we have identified four challenges that require action:

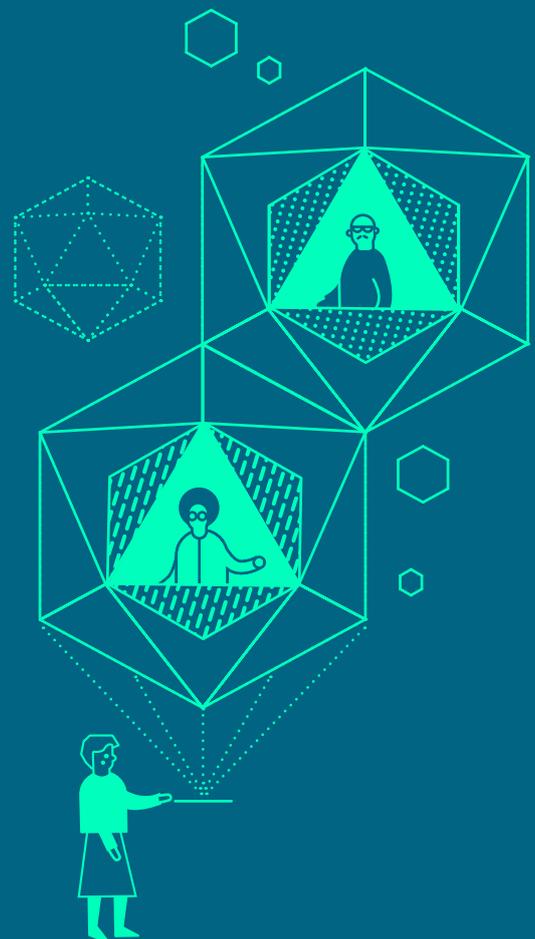


Challenge: Equitable access must be provided to learners and instructors.

Based on the finding that inequalities run deeper than previously thought, **equitable access must become a top priority**. The tendencies toward such disparities in access, participation, and use of digital teaching and learning technologies may even become stronger if these effects are not mitigated. If the future of higher education teaching and learning is online and in some flexible or hybrid format, questions about students' access to reliable internet and technology will persist. Equitable access should be provided to learners and instructors and across all regions. This requires the development of infrastructure, broadband, and devices.

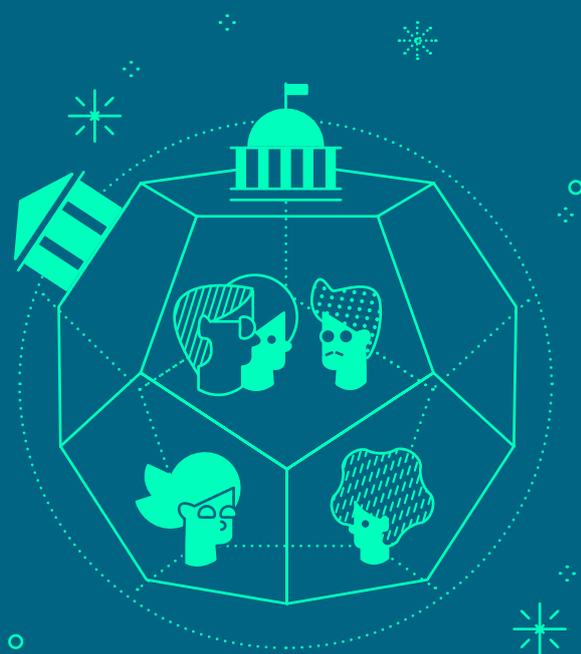
Challenge: Institutional digital transformation must take place at HEIs.

In accordance with the finding that a **digital transformation process must occur across all levels of HEIs**, higher education leaders must develop preparedness for the unknown, making staff ready to pivot toward innovative digital technologies and fostering a mindset to advance the mission of individual student success and equitable learning for all. Involving all stakeholders will ensure demand-tailored solutions and a holistic cultural shift toward digital learning. Within the higher education system, HEIs must come to view themselves as equalizers that can advocate for the needs of their students and provide crucial evidence-grounded support, both technological and non-technological, that is currently lacking for many learners.



Challenge: Digital literacy must be trained and developed.

In response to the finding that **faculty members and teaching staff require institutional support** to move their teaching online, staff training and development must focus on digital literacy. This includes cultivating the confidence and skills that instructors acquired during the pandemic, merging these new competencies with existing knowledge on human learning, motivation, and digital pedagogies, and casting them into regular and formalized teacher training.



Challenge: Virtual collaboration must be fostered.

Based on the finding that collaboration is a fundamental element of the digital transformation of higher education and that demand is increasing for alternatives to traditional student mobility, **a shift toward virtual collaboration is timely**. Beyond inequalities at the individual level, inequalities are also present between systems, where they can manifest in unequal internationalization efforts that create unidirectional student mobility. Collaboration and resource sharing must, as such, become the foundation of higher education models. Traditional student mobility gives rise to the issue of brain drain, whereas virtual student mobility, or internationalization at home, could offer new opportunities for collaboration and culturally sensitive teaching. To seize these opportunities, higher education leaders should work toward open education, collaboration and resource sharing, and knowledge transfer.

All efforts undertaken to tackle these challenges should consider advances from the field of learning science. The following sections will explore, in greater detail, how each challenge can be addressed.

3.1 Equitable Access

Access as a Key Challenge

The factors contributing to inequality in learning are extensive and well known. The **socioeconomic factors manifest similarly across the world** and are typically summarized as affecting low-income earners, women, and minoritized populations. These individuals are the least likely to participate in higher education and the least likely to obtain good quality higher education following the COVID-19 pandemic. Although more developed societies have made significant strides toward improving the participation rates of women, this progress has not necessarily extended to minoritized or low-income students.

While socioeconomic factors continue to plague the system, COVID-19 demonstrated that higher education could look to digital transformation to substantially increase **access and quality for students**. Digitalization remains a factor in inequality since internet access is unequal, but it can also become a mechanism to improve access and equality. In *The Fifth Wave: The Evolution of American Higher Education*, the authors identify a group of U.S.-American HEIs that are poised to accelerate social outcomes by synthesizing knowledge production and technology to better serve increasing numbers of students.²⁰

Emergency remote teaching provided throughout 2020 and into 2021 was highly dependent on access to **internet connectivity and reliability**. In the United States, 44 percent of U.S.-American based students experienced connectivity issues that interfered with their remote learning, “with 16 percent of students experiencing such problems often or very often.”²¹ Moreover, the survey found that fewer students were hindered by limited access to devices. While HEIs made deliberate efforts to address their students’ connectivity problems by partnering with communities and businesses, it is clear that the campus itself remained a better place for internet connectivity and suitable devices.

Outside of the U.S., however, very different patterns in digital access occurred, depending upon each country’s wealth and the state of its telecommunications infrastructure. Analysis of a combination of World Bank income groups and United Nations development categories indicates that the higher a country’s income and level of development, the less internet connectivity was a disruptive factor in delivering education to its students.²² Of course, in all countries—including well-connected countries—complicating **issues of broadband access, reliability, and stability** for sub-populations persist.

During the pandemic, some HEIs in lower-income and least-developed countries had internet connectivity, but because those countries also followed the social distancing recommendations of the World Health Organization, many students were unable to continue their coursework when they returned home from their HEIs. Across the world, **learner outcomes are more diverse now than in the past** due to varying access to internet connections and the quality of the remote experience. The OECD reported that educational institutions, especially at primary and secondary levels, did a remarkable job in maintaining continuity in the emergency, but “... the learning loss that has already occurred will, if left unremedied, likely take an economic toll on societies in the form of diminished productivity and growth. As a rough guide, a lost school year can be considered equivalent to a loss of between 7% and 10% of lifetime income.”²³

In fact, the much more significant issue in education is not the availability of the internet but the fact that the university system is **based on legacy practices and place-bound infrastructure**. The time-honored tradition is that students must gather to receive and learn knowledge. Despite global leaders’ advocacy of digital transformation,

20 — Crow, M. & Dabars, W. B. (2020). *The fifth wave: The evolution of American higher education*. Johns Hopkins University Press. DOI: 10.1353/book.73164

21 — Means, B. & Neisler, J. (2020). *Suddenly online: A national survey of undergraduates during the COVID-19 pandemic*. Digital Promise. Retrieved from <https://digitalpromise.dspacedirect.org/handle/20.500.12265/98>.

22 — World Bank Development Research Group. *The Gini index*. Retrieved from <https://data.worldbank.org/indicator/SI.POV.GINI?view=map>

United Nations (2020). *World economic situation and prospects*. Retrieved from https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf

23 — Reimers, F., Schleicher, A., & Ansah, G. (2020). *A framework to guide an education response to the COVID-19 pandemic of 2020*. Secretary-General of the OECD. Retrieved from https://globaled.gse.harvard.edu/files/geii/files/framework_guide_v2.pdf

much of the higher education system remains relatively uninformed regarding such a transformation, as well as improvements in learning science and integrated change management, that could move it from a legacy industry to a transformed digital knowledge enterprise.

The Necessity to Modernize Infrastructure

Digital transformation is well underway. Prior to the pandemic, this transformation represented a major initiative for nearly half of all industries, yet to no one's surprise, the education sector lagged.²⁴ That is, while educational institutions were utilizing enterprise digital tools, these tools were not applied as extensively in the industry's primary service of teaching and learning, and their use often failed to consider how learning science might guide better practices. These shortcomings, which equate digital transformation more with online education or simple modernization than with a wholesale reinvention of higher education, are **a point of contention for many in higher education**.

Gartner, a worldwide IT consulting and research company, emphasizes this distinction in its definition of digital transformation. The company explains that the term can refer to numerous concepts and constructs, including IT modernization (for example, cloud computing), digital optimization, and the invention of new digital business models. The term "digital transformation" is widely used in public-sector organizations to refer to modest initiatives such as putting services online or legacy modernization. Thus, it entails more "digitization" than "digital business transformation."²⁵

The digital transformation required today is much more complex and must involve the coordination of people, processes, and tools. While spending on IT in 2019 exhibited a pattern of investment in digital transformation, a lag remains due to resistance from employees, especially teaching staff, unclear development paths disconnected from what we know about learning and motivation, and a lack of leadership.²⁶ The **digital leadership that HEIs need in order to develop quality digital learning** demands a proficient understanding of the potential of digital technology, a high level of strategic thinking, and an application of the evidence about learning and motivation.²⁷

Toward a Research-Based Approach

The lingering question is whether the pandemic-fueled acceleration of the digital transformation will incorporate more of what is known from learning science research. Learning science research includes **decades of well-established findings**, but much of that work was ignored as HEIs maintained the status quo. The principles of learning science research, which derive from an interdisciplinary foundation, focus on applying significant educational research to teaching and learning.²⁸

The learning science domain's continued growth has included the recent establishment of the **subdomain of learning engineering**.²⁹ Prior to the pandemic, learning engineering was considered an evolving field for instructional designers, especially in digital environments, since it connected learning science, computer science, and data science. Many learning scientists and learning engineers alike would argue that a systematic approach to improving learning should be applied regardless of the specific learning modality.

Learning science, whether truly engineered or not, must be deemed foundational to post-COVID-19 digital transformation processes and particularly to efforts to stem learning loss. According to Clark and Saxberg, considering just one learning engineering approach to **enhance students' motivation to learn** demonstrates the field's importance. In their Belief-Expectancy-Control framework, the authors emphasize the need

24 — Plummer, D. (2020). *Gartner's top strategic predictions for 2020 and beyond: Contemplating the human condition* [Presentation]. *EDUCAUSE Annual Conference*.

25 — Gartner Research (n.d.). *Information technology glossary*. Retrieved from <https://www.gartner.com/en/information-technology/glossary/digital-transformation#:~:text=Digital%20transformation%20can%20refer%20to,services%20online%20or%20legacy%20modernization>

26 — Alexa, J. (2019). *Digital transformation in the European education sector*. International Data Corporation. Retrieved from <https://blog-idceurope.com/dx-in-education/>

27 — Arnold, D. & Sangrà, A. (2018). Dawn or dusk of the 5th age of research in educational technology? A literature review on (e-) leadership for technology-enhanced learning in higher education (2013-2017). *International Journal of Educational Technology in Higher Education*, 15, 1-29. DOI: 10.1186/s41239-018-0104-3

28 — Ambrose, S., Bridges, M., DiPietro, M., Lovett, M., & Norman, M. (2010). *How learning works: Seven research-based principles for smart teaching*. Jossey-Bass. Retrieved from <https://firstliteracy.org/wp-content/uploads/2015/07/How-Learning-Works.pdf>

29 — Wagner, E. (2019). *Learning engineering: A primer*. The Learning Guild. Retrieved from <https://www.learningguild.com/insights/238/learning-engineering-a-primer/>

for instructional strategies to address motivation to learn and identify the factors most important in increasing that motivation. While the motivation to learn "...conservatively affects about 30% of learning and transferring or applying what is learned and over 40% of group performance..." research on motivation remains scarce.³⁰ For example, layering the understanding of motivation onto systems learning data, such as data from adaptive systems, suggests that if students do not engage in academic work very early in a course, they are highly likely to fail or drop out.³¹

Prioritizing key findings from the learning sciences should provide guidance on how best to focus **instructional strategies for improved learning**.³² The digitalization of the remote experience and the explosion of digital tools provide a data set that enables the higher education sector to analyze and better direct its efforts to transform instruction. The ability to layer learning science research onto digital learning data becomes even more pertinent as educators recognize the extent of the learning loss that occurred during the pandemic, which must be addressed to avoid a further decline.

Integration of Systematic Change Management

Perhaps the most complex and pervasive legacy-based educational issue, especially in higher education, is **integrated systematic change**. In a recent guide to improving critical courses, Vignare and Lorenzo recommend that academic administrators build a collaborative continuous improvement process.³³ Collaborative change is challenging in a legacy industry that values independence and academic freedom. The pandemic impelled the higher education system to appreciate the need to enhance high-priority courses: not only to employ new learning sciences but also to reduce equity gaps created by outdated approaches.³⁴ This work requires a **culture shift from a faculty-centric to a student-first understanding of improved equity**. Learning science provides robust evidence that instruction becomes more effective—both in motivating learning and in improving cognitive skills—when students are encouraged and enabled to integrate their talents and identities into their coursework. Academic administrators must, therefore, realize the significance of constructing a robust and effective team of faculty and others who support instruction and whose goal is to continuously improve student outcomes, subgroup by subgroup, by applying evidence from prior research and current practices.

Of course, higher education faculty members should be lauded for their work in maintaining academic continuity during the pandemic. Nevertheless, the necessity of their work in the context of a crisis demonstrates that institutions, while coming together for a historical problem, have squandered much of the **educational improvements that are now possible** through the combination of digital transformation, the application of learning science at scale, and integrated change management. Indeed, this process is complex, and HEIs must offer, require, and reward additional professional development for educators.

Professional development is available, but too often, the instructors who pursue these opportunities are those who already teach effectively, and institutions insufficiently prioritize or reward educational areas where continuous improvement might affect students more equitably. Ehrmann explores the transformation of HEIs from gatekeepers of professional development opportunities to dynamic change makers charged with improving the quality of and access to those opportunities. He recognizes both the need for an integrated approach to professional development and the potential for effective professional development to produce three-fold gains in all areas—**quality, access, and costs**.³⁵ Crow and Dabars echo this argument while emphasizing the need to implement an overhaul of faculty roles.³⁶ Higher education is often assumed to face a catch-22 wherein access and quality improvements necessarily cost more. Nonethe-

30 — Clark, R. & Saxberg B. (2018). Engineering motivation using the belief-expectancy-control framework. *Interdisciplinary Education and Psychology*, 2, 4. DOI: 10.31532/interdiscipeducpsycho1.2.1.004

31 — Dziuban, C., Howlin, C., Moskal, P., Muhs, T., Johnson, C., Griffin, R., & Hamilton, C. (2020). Adaptive analytics: It's about time. *Current Issues in Emerging eLearning*, 7, 4. Retrieved from <https://scholarworks.umb.edu/ciee/vol7/iss1/4>

32 — Clark, R. C. & Mayer, R. E. (2021). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). John Wiley & Sons.

33 — Vignare, K., Lorenzo, G., Tesene, M., & Reed, N. (2020). *Improving critical courses using digital learning & evidence-based pedagogy*. Joint publication of Association of Public and Land-grant Universities and Every Learner Everywhere. Retrieved from <https://www.everylearnereverywhere.org/resources/improving-critical-courses-using-digital-learning-evidence-based-pedagogy/>

34 — Krumm, A., Means, B., & Bienkowski, M. (2018). *Learning analytics goes to school: A collaborative approach to improving education*. Routledge. DOI: 10.4324/9781315650722

35 — Ehrmann, S. (2021). *Pursuing quality, access, and affordability: A field guide to improving higher education*. Stylus Publishing.

36 — Crow, M. & Dabars, W. B. (2020). *The fifth wave: The evolution of American higher education*. Johns Hopkins University Press. DOI: 10.1353/book.73164

less, advocates of digital transformation have increasingly argued that all three areas can benefit by **integrating technology and change management** and committing to a continuous review of the process.

Faced with the abrupt and unprecedented changes of the pandemic, faculty at all levels of the educational system have exhibited a passion for continuing to help their students while teaching remotely. Underlying their work, however, is a system in dire need of change. As such, as we move toward the next phase of educational transformation and promote student-centric advancements, stakeholders must refrain from scapegoating instructors and, instead, **prioritize investments in professional development**. These investments must leverage what we know and can apply from digital transformation, learning sciences, change management, and continuous improvement.

Across all societies, there is an understanding that advanced learning supports social mobility. In a digital world, a college degree further promotes adequate and continued employment. Higher education is thus well-positioned to serve as an equalizer, but the industry's willingness to embrace this role has been limited, and the loss of learning that has occurred due to the pandemic poses an additional threat to efforts to capitalize on its full potential. While evidence regarding the consequences of unequal educational outcomes is compelling, the industry cannot—unlike in the past—blame these consequences solely on the circumstances and experiences of learners before they entered higher education. Instead, HEIs must concentrate any remaining vestiges of their traditional focus on serving the privileged and highly motivated and work to **improve access to and quality of educational opportunities for all**.

The pandemic requires that we, as higher education leaders, change and understand ourselves as change makers. We must, therefore, fully embrace the transformative roles that are slowly taking hold by using science and technology to expand and improve learning while recognizing and striving to implement the future that is within our grasp.

3.2 Institutional Digital Transformation

Anchoring Digitalization at the Institutional Level

If HEIs intend to advance beyond the reactionary measures created during the pandemic, they must embrace visionary leadership for a “new normal” and define goals for their digital teaching and learning strategies. The experiences of 2020 can provide a necessary impetus to identify which elements can be sustainably **anchored in the strategy, structure, and culture** of institutions and thus become crisis-proof in the long term, remain fit for the future, and drive further innovations. To this end, HEIs must gather decision-critical information at an early stage and promptly and actively involve the relevant stakeholders in a strategic process.

Effective online learning has its roots in careful instructional design and planning grounded in the sciences of learning and development, which offer a systematic and iterative model for design and development. Since the design process and the careful consideration of various design decisions influence the quality of instruction, a structured decision-making process should, in turn, accommodate the **diverse perspectives of stakeholder groups** and garner increased public participation. Numerous stakeholders should be involved in a differentiated and focused manner with a continued emphasis on lessons from learning and development science to meet these complex criteria. The following roadmap outlines the process to make current experiences usable in the long term. It must, however, be noted that the goals for digital learning will differ between institutions, countries, regions, and higher education systems.

HEIs must pursue sustainable development and profile building within the framework of overarching strategies. Digitization can be part of such overall strategies, which necessarily extend beyond any individual aspect and focus on synergies of different focal points. Indeed, digitization can be employed in a remarkably constructive and productive way when it is seen as part of overarching strategies to improve the outcomes of all learners and, as such, the entire HEI. With this in mind, then, HEIs should focus on institutional frameworks relevant in the digital age.

Strategic **goals for digitization in teaching and learning** must be clearly formulated, prioritized, and communicated. An explicit understanding within the institution of what is meant by “digitization in teaching and learning” is essential. Discussions could revolve around questions like the following: Do we want to provide greater access to learning? Can we achieve better learning? Can we make learning more inclusive of marginalized groups? Can we increase internationalization?

Based on their answers to these questions, stakeholders can develop a **mission statement for teaching** in the digital age and a guiding framework for the entire institution. A structure for the advancement of digitally supported teaching and evidence gathering can also support efforts to craft short-, medium-, and long-term goals and measures at all levels of the institution, including individual faculties and departments.

Particularly in the context of digitization, **collaboration may be the key** to successfully shaping digital transformation, externally expanding existing forms of cooperation, and developing new educational offerings. For example, HEIs can enter into cooperation agreements with other institutions to augment their own offerings. In addition, it may be necessary to develop mechanisms of communicating new technologies as well as pedagogies through ministries of (higher) education, accreditation agencies, university associations, qualification authorities, and other higher education-related organizations with local, regional, national, or international coverage and consideration.

Learning science research also plays an increasingly strategic role in the further development of studies and teaching in the digital age. Digital environments offer real-time data, and these data and analyses allow HEIs to learn much more about what works and for whom. Analyzing innovative approaches using a **framework constructed from learning science research** would enable educators to know more quickly how to help different kinds of students in their learning. While adjusting to and using implementation science in projects will require significant changes in processes, doing so can offer HEIs a more sophisticated learning environment wherein testing and implementing can occur more directly and iteratively in teaching.

Technologies useful to teaching and evidence-gathering assessments are currently being developed, but knowledge about their development is not widespread. Here, it may be helpful to look beyond traditional education contexts. For example, the software and technology of the video game industry draws heavily upon motivational theories regarding user engagement and could help inform further developments in learning science and education technology to enhance student engagement.³⁷ Technology evolves at a rapid pace, and, in turn, HEIs are required to dedicate resources to **remain current with effective technologies** and to measure whether the tools employed contribute to the strategic goals and equitable success for all students. To harness such developments and capitalize on advances in new pedagogies, HEIs must pursue closer collaboration with the education technology industry and the private sector.

Institutional Support for Digitalization

Further development of higher education in the digital age requires reconciling top-down and bottom-up processes in learning by defining clear responsibilities for all parties. That is, in addition to the commitment of HEI management to actively shape strategic development, the HEI must also establish **sustainable decision-making structures** between HEI management and its faculties and departments and define responsibilities at various levels. Moreover, the HEI should strive to involve all status groups as well as the central institutions, administrative bodies responsible for studies and teaching, and students in its strategy development as far as possible.

For the digital transformation of higher education to succeed, sufficient human and financial resources must be made available on a sustainable basis. Financing must be secured through **sustainable financial planning** in cooperation with the HEI management and its faculties and departments. Particularly for smaller HEIs, this can also be made possible through collaboration with other institutions by developing and using a joint infrastructure and support structure.

The financing of a digital learning infrastructure is critical to the process of digital transformation in HEIs. This infrastructure will require the same continuous improvement used to identify appropriate and effective teaching and evidence-gathering tools. The physical technology infrastructure—nationwide broadband connection, well-functioning wireless network equipment, and widely available modern hardware and software solutions—is crucial for realizing digital application and deployment scenarios. HEIs must also consider ways to promote equitable access, especially if students are not on campus. The establishment of meaningful technical infrastructures requires significant financial investments, on the one hand, and a wise and sustainable selection of solutions on the other. These efforts must take synergies in the HEI's structures into account and be geared toward strategic institutional development planning. The development of **technical learning infrastructures** is, therefore, a central task of strategic higher education management.

HEIs must plan to support the technical infrastructure with consulting and support services for both students and instructional staff. Especially in the context of the digital transformation of teaching and learning, a supportive framework grounded in evidence about learning and motivation also determines whether teachers and students use new formats, platforms, concepts, and tools. Inexperienced teachers, in particular, require reliable **media-didactic support** from professional service institutions.

Institutional Culture for Digitalization

If the implementation of digital learning environments is to have a lasting effect, instructors must fully buy into the process. In other words, rather than simply being required to change their teaching habits, instructors must become convinced of the value of digitalization and thus willingly change their instructional approaches based on evidence (for example, from a lecturer-led to a supportive teaching style), experiment with new electronic forms of examination, and prepare and improve courses over the longer term in cooperation with external agencies. Such collaboration is facilitated when learning resources are shared via a learning platform and teachers' actions thus become more transparent. Therefore, beginning with its management, the HEI must create **innovative spaces and solutions** that support and initiate processes of cultural change and continue to improve them based on evidence gathered along the way.

To increase the acceptance of new teaching modes, HEIs should offer attractive **incentive formats** for instructors using innovative teaching, learning, and examination

formats. Incentives can be created by, for instance, enhancing the reputation of evidence-grounded and technology-enhanced learning and by involving teachers in decision-making processes. At the same time, monetary incentive structures and benefits, such as tenure decisions, play an influential role.

Personnel development is an essential component in the implementation of digital teaching and learning. It may be achieved, first, by considering instructors' efforts toward digitalization in appointment procedures and the expansion of corresponding continuing education programs for teachers and, second, by expanding the personnel structure through science-supporting staff (e.g., employees in media and didactic centers, evidence-grounded instructional designers, etc.).

Institutional Commitment to Diversity, Equity, and Inclusion

The mandate of HEIs extends beyond the individual institution. If higher education leaders are to see themselves as change makers of education, they must commit their institutions to **diversity, equity, and inclusion** and enact these values in the higher education sector through appropriate means. Management must not merely represent students but exhibit a genuine commitment to a learner-centric strategy. One early success in this area is open education. In recent years, open education advocates have called for the **wider adoption of open educational practices** (OEPs), including the use of open educational resources (OERs) and open pedagogies. Open education not only lowers costs for students but also makes learning content immediately accessible.

The central tenet of open education is that resources reside in the public domain or are released under open licenses permitting their use, adaptation, and redistribution. The "5 Rs" of OER—retain, reuse, revise, remix, and redistribute—thereby encourage the transformative use of materials in individual teaching and learning contexts and make education more attainable for those currently not engaged in, or distanced from, formal education.³⁸

Of course, in terms of open pedagogies, no one pedagogical method could effectively serve all HEIs. Nevertheless, the need remains for HEIs to **share emerging pedagogical approaches globally**. Open educational practices thus require an institutional open education strategy to assist instructors in designing curricula that are context- and learner-specific, necessitating, in turn, knowledge regarding licenses, open practices, and technical support.³⁹

Approaches like open education can complement a HEI's efforts in employing digital learning to **broaden access and improve learning outcomes** by enabling collaborative experimentation with teaching methods, highlighting the benefit of sharing best practices, and enabling iterative improvements to educational processes within and across specific contexts. While learners have experienced improved access to content, learning is much more than content. OER must, therefore, be guided by learning science to ensure that content is aligned with evidence-gathering activities and assessments. Without a systematic approach, the success of OER will be limited. An ongoing issue with the potential to limit the success of OER is funding. Creating effective OER requires resources, and until adequate funding models are found, OER will not be able to compete with the for-profit development of educational resources.

38 — Wiley, D. A. (2021). Open educational resources: Undertheorized research and untapped potential. *Educational Technology Research and Development*, 69, 411–414. DOI: 10.1007/s11423-020-09907-w

39 — Cronin, C. (2017). Openness and praxis: Exploring the use of open educational practices in higher education. *International Review of Research in Open and Distributed Learning: IRRODL*, 18, 15–34. DOI: 10.19173/irrodl.v18i5.3096

Bali, M., Cronin, C., & Jhangiani, R. S. (2020). Framing open educational practices from a social justice perspective. *Journal of Interactive Media in Education*, 2020(1), 10. DOI: 10.5334/jime.565

3.3 Digital Literacy

Digital Divide and Uneven Digital Literacy

The term “digital divide,” which has historically described the results of inequitable access to digital tools and technologies, has recently expanded to include uneven access to the knowledge and skills required to effectively use these resources.⁴⁰ Access is distributed across the landscape of higher education in predictable ways that map to demographic and other cultural fracture lines. Many students have fewer **opportunities related to digital tools and technologies** than their peers, despite the fact that information communication technology has been identified as a critical component of academic, career, and personal success.⁴¹ New scrutiny regarding the challenges of implementing evidence-based instructional practices has led to the realization that instructional staff also have widely varying experiences, training, and practice with information communication technologies and their associated pedagogies.

We now know a great deal about instructors’ and institutions’ efforts to support students in accessing digital tools and technologies.⁴² Evidence-based instructional practices can help students to develop digital literacy skills, thereby empowering them to **use digital tools and technologies effectively**.⁴³ Recent research has illustrated, however, that while HEIs must do more to foster the development of digital literacy among students, their instructional staff are, for three reasons, not equipped to take on this task.⁴⁴ First, many educators who fail to recognize a digital divide among their students expect students to utilize digital tools even when they may be ill-equipped to do so. Second, many educators themselves lack a sufficient level of digital literacy to foster their students’ development of these skills. Finally, because many HEIs do not explicitly promote digital literacy development strategies at a program or curricular level, they fail to mitigate the existing digital divide among students.

Students are often **portrayed as tech-savvy digital natives**, while **faculty are perceived as reluctant** to adopt novel tools and pedagogies. Nevertheless, these assumptions are disconnected from actual practices and rooted in proven myths of generational differences⁴⁵, faculty technophobia⁴⁶, and the innate digital fluency of youth⁴⁷. These problematic narratives do a disservice to faculty, students, and institutions. The “digital native” trope is particularly insidious because it suggests that students are expert technology users who do not **require training or support** to utilize digital technologies effectively. Instead, the narrative indicates that students can use all technologies, including tools and technology they have not previously encountered, with ease and that students will rapidly master any new tools and technology they are asked to use. In many cases, students have been asked to adopt multiple new tools and technology for different purposes simultaneously and are thus forced to swiftly master many new skills and integrate many new technologies. These efforts constitute a significant burden and contribute to students’ cognitive load, divert time from studies and non-academic activities, and become an additional source of stress, even for those students with high degrees of digital literacy and sufficient access to tools and resources. The result of this narrative and the proliferation of educational technology in HEIs for students who lack access to digital tools or technologies and students without the digital literacy skills of their peers is, therefore, the imposition of **numerous barriers to high-quality educational experiences**. This type of rhetoric prioritizes students with access and digital literacy and portrays faculty who are slow to incorporate new digital strategies into their teaching practice as irrational or stubborn. Glossing postsecondary educators as an undifferentiated body of faculty similarly ignores the diversity of roles that these individuals have with respect to institutional resources and structures, the different experiences that instructional

40 — International ICT Literacy Panel (2002). *Digital transformation: A framework for ICT literacy*. Educational Testing Services. Retrieved from <http://www.ets.org/Media/Research/pdf/ICTREPORT.pdf>

41 — Partnership for 21st Century Learning (2015). *P21 partnership for 21st century learning*. Retrieved from http://static.battelleforkids.org/documents/p21/P21_Framework_Definitions_New_Logo_2015_9pgs.pdf

42 — Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: Measuring digital literacy. *Economics: The Open-Access, Open-Assessment E-Journal*, 1-20. DOI: 10.5018/economics-ejournal.ja.2018-23

43 — Hillier, M. (2018). Bridging the digital divide with off-line e-learning. *Distance Education*, 39, 110-121. DOI: 10.1080/01587919.2017.1418627

44 — Santos, A. I. & Serpa, S. (2017). The importance of promoting digital literacy in higher education. *International Journal of Social Science Studies*, 5, 90-93. DOI: 10.11114/ijsss.v5i6.2330

45 — Sanchez-Prieto, J., Trujillo-Torres, J. M., Gómez-García, M., & Gómez-García, G. (2020). The generational digital gap within dual vocational education and training teachers. *European Journal of Educational Research*, 9.4, 1557-1567. DOI: 10.12973/eu-jer.9.4.1557

46 — Mercader, C. (2020). Explanatory model of barriers to integration of digital technologies in higher education institutions. *Education and Information Technologies*, 25, 5133-5147. DOI: 10.1007/s10639-020-10222-3

staff members bring to their professions, the variety of training programs and support available to HEI educators, and the affordances and constraints of their educational contexts.

Digital Literacy and Pedagogical Competencies

Efforts to close the digital divide have frequently failed to produce robust and sustained results. It is necessary but not sufficient to intentionally combat **uneven digital literacy among students**. Indeed, systemic challenges are most effectively addressed systemically. If we are to effectively support all students in developing critical digital literacy skills, we must consider the various systemic barriers that have stymied efforts to date. These include factors such as inadequate training of HEI educators, the precarity of academic labor, and diverse access to communication infrastructures in HEIs around the world.

Much like students, faculty are diverse in their experience and comfort with communication technologies and technology-enhanced pedagogies.⁴⁸ Yet, **HEI educators in various roles often lack any formal pedagogical training**.⁴⁹ Without formal training in teaching, most postsecondary instructional staff teach the way they themselves were taught as students and use the teaching tools and strategies with which they are familiar. As a result, many educators fail to consistently implement evidence-based practices or to engage in an intentional process of continuous improvement.

Educators hail from diverse backgrounds and contexts of access. Their educational experiences affect their digital literacy, both throughout their academic experiences as students and later in their personal and formative experiences as teachers. Many educators assume instructional roles in HEIs without previously having had access to digital technologies or other formal or informal opportunities to develop digital literacy skills.

Within each HEI, faculty have distinct prior experiences and are often diverse in their professional preparation for teaching in general and teaching with technology in particular. Effective teaching using digital tools and technologies **requires specific pedagogical skills and specialized knowledge**. Just as students in higher education systems come from differing backgrounds with respect to digital tools and technologies, faculty also enter their professional careers with varying levels of digital literacy.⁵⁰ The social inequality in access to basic infrastructure necessary for digital learning, such as computer devices and the internet, affects faculty both in their general level of digital literacy and in their specific applications of digital tools and technologies that are compatible with effective technology-enhanced learning pedagogies. Educators lacking both digital and professional competencies are at a severe disadvantage when teaching students using digital technologies and are hard-pressed to support students in developing the digital literacy skills that they themselves lack. Most postgraduate programs focus on training Ph.D. candidates in disciplinary skills and knowledge. Meanwhile, pedagogy, human learning and motivation, education research, and digital literacy are rarely part of the doctoral curriculum. Consequently, new Ph.D. graduates generally lack these skill sets, and it thus falls to HEIs to prepare new hires for their roles as instructors.

The **global precarity of academic labor** had already reached new heights before the COVID-19 pandemic. Precarious academics are those working in a variety of contractual arrangements, including zero-hour or short-term contracts. A rise in this uncertainty has been linked to increased global academic mobility.⁵¹ Ever fewer educators at HEIs worldwide enjoy job security, robust compensation, or access to the infrastructure, support, and resources available to their more securely employed colleagues; in fact, even when they are granted equal access to infrastructure and technology, they are likely to receive less or less consistent training in key skill sets, such as evidence-based pedago-

47 — Kirscher, P. A. & Bruyckere P.D. (2017). The myths of the digital native and the multitasker. *Teaching and Teacher Education* 67, 135–142. DOI: 10.1016/j.tate.2017.06.001

48 — Herckis, L. (2018). Passing the baton: Digital literacy and sustained implementation of elearning technologies. *Current Issues in Emerging eLearning*, 5, 4. Retrieved from <https://scholarworks.umb.edu/ciee/vol5/iss1/4>

49 — Ambrose, S., Bridges, M., DiPietro, M., Lovett, M., & Norman, M. (2010). *How Learning works: Seven research-based principles for smart teaching*. Jossey-Bass. Retrieved from <https://firstliteracy.org/wp-content/uploads/2015/07/How-Learning-Works.pdf>

50 — Beach, A. L., Sorcinelli, M. D., Austin, A. E., & Rivard, J. K. (2016). *Faculty development in the age of evidence: Current practices, future imperatives*. Stylus Publishing.

51 — Loher et al. (2019). On politics and precarity in academia. *Social Anthropology*, 27, 97–117. DOI: 10.1111/1469-8676.12695

gy and digital literacy. Precarious academics are **reliant on their own devices, internet access, and proficiencies** in pedagogy and digital technology. The economic insecurity and mobility of these educators further inhibit access to social support and necessary resources. This problem is compounded by the fact that these academics now develop and deliver a significant proportion of educational experiences at HEIs worldwide. If instructors are not themselves digitally literate, they can neither create nor deliver effective educational experiences in digital media or guide students to higher levels of digital literacy.

Moreover, **institutions face an extensive range of barriers** to the successful implementation of digital learning in higher education. Globally, HEIs vary broadly in their access to infrastructure, technologies, and support. The result is uneven access to the internet, digital devices, tools and platforms, and opportunities to use these effectively among faculty both within and between institutions. Additional barriers exist between institutions and the communities they serve, with a significant proportion of HEIs reporting no adequate communication infrastructure in place.⁵²

Digital Learning in a Time of Crisis

The rapid transformation of global learning in the Spring of 2020 highlighted the potential for digital tools and technologies to meet acute educational needs. In a worldwide survey of HEIs, two-thirds of students reported that classroom teaching had been replaced by distance learning.⁵³ **Digital tools and technologies made continuity possible** and were implemented more quickly than anyone might have imagined. Amid this upheaval, institutions put unprecedented policies and transformational practices into place; however, extensive planning and preparation were not possible due to the emergent nature of the crisis. Expertise in evidence-based pedagogies, high levels of digital literacy, and robust support infrastructures were available to some people in some institutional and global contexts but wholly unavailable to others elsewhere. Institutions have diverse systems and access, and even when levels of access are similar, the specific tools, affordances, and pedagogical practices involved in implementation vary. The COVID-19 pandemic exacerbated these inequities on every level, and students, educators, and administrators alike are still identifying the impacts of these changes.

As a result of cascading interdependencies, many students found the educational experiences delivered in the early days of the global pandemic **less effective, less engaging, and less satisfying** than their pre-pandemic experiences. Challenges with connectivity, hardware, software, and changing expectations hindered student experiences and outcomes. Students at HEIs worldwide did not experience these challenges evenly; rather, problems varied predictably along socioeconomic, racial, ethnic, urban, rural, and other cultural divides.⁵⁴ At the same time, the crisis deepened an already significant chasm between the lived experiences of those with access to digital tools and technologies and those without them.

As we have seen, teaching effectively with technology requires extensive planning and preparation, expertise in evidence-based pedagogies, high levels of digital literacy, and robust infrastructures of support. Course transformation requires time and resources, but even the most well-resourced and prepared HEIs were not afforded much time for a transition during the COVID-19 pandemic. Furthermore, few educators had the necessary expertise, and **not all institutions could provide solid support infrastructures**. While many existing curricula, course plans, and educational experiences could be readily transferred to remote, hybrid, asynchronous, or other alternative modes of delivery, some were better suited for a smooth transition than others, and some institutions were better situated to make these shifts than others.⁵⁵

52 — Marinoni, G., van't Land, H., & Jensen, T. (2020). *The impact of Covid-19 on higher education around the world*. IAU Global Survey Report. Retrieved from <https://www.iau-aiu.net/Covid-19-Higher-Education-challenges-and-responses>

53 — Ibid.

54 — Means, B. & Neisler, J. (2020). *Suddenly online: A national survey of undergraduates during the COVID-19 pandemic*. Digital Promise. Retrieved from <https://digitalpromise.dspacedirect.org/handle/20.500.12265/98>

55 — Marinoni, G., van't Land, H., & Jensen, T. (2020). *The impact of Covid-19 on higher education around the world*. IAU Global Survey Report. Retrieved from <https://www.iau-aiu.net/Covid-19-Higher-Education-challenges-and-responses>

The onset of the global pandemic in 2020 produced seismic shifts in the extent to which people were able to work, nurture their family relationships and fulfill their responsibilities, maintain community engagement, pursue their schooling, and enjoy opportunities for recreation and in all other sectors of life. Prior to the pandemic, many HEIs had existing structures to support students and faculty with limited access to tools and resources. Even where such frameworks did not exist, marginalized individuals strove to maintain their relationships in academia via carefully cultivated strategies that enabled them to participate in the academic activities expected of them. When the world turned upside down, however, **the digital divide widened**. Many students and faculty who had been able to engage effectively with HEIs through the careful orchestration of personal and professional activities found that these strategies were no longer sufficient.

Institutional responses included initiatives to support faculty mental health, the provision of childcare, proctoring, tutoring services, decisions to suspend teaching evaluations and offer alternative pathways or timelines for tenure and promotion, and additional training and support for digital transformation.⁵⁶ Nonetheless, not all HEIs had the resources needed to offer these support mechanisms. Where such support was made available, many already disadvantaged educators could not benefit because some institutions mitigated the economic impact of the pandemic by terminating short-term contracts, reducing teaching staff, and suspending pay increases or pay decreases, which left precarious academics behind.⁵⁷ Other HEIs offered support to educators who could not otherwise take advantage of these opportunities due to additional impacts on their personal lives, including, for instance, new caregiving responsibilities and reduced access to critical infrastructures, such as public transportation or communication technologies. To engage with many of these resources and support, **faculty required access and digital literacy**, both of which they lacked. The additional support and resources made available during the pandemic overwhelmingly addressed unmet needs, many of which predated the pandemic and will extend into its aftermath, thereby lessening the devastation associated with COVID-19. However, these novel support measures were unevenly distributed across the global landscape of higher education and, in some instances, may prove insufficient to ensure that HEIs can weather this storm. Indeed, some institutions will not survive—or have not survived—the current crisis. Other institutions that have effectively integrated additional support for faculty and students must still grapple with whether these new levels of support are sustainable and whether they might be equitably extended to all students and instructional staff in the future.

Combating the New Digital Divide

Myriad new dimensions of the digital divide have emerged in the wake of an acute global crisis. Existing disparities have been thrown into stark relief, and HEIs have risen to the occasion with a diverse suite of strategies to rapidly develop necessary digital literacies among students, faculty, and staff. Consequently, it is now more pressing than ever before that we work to close these gaps and **support students, educators, and institutions** in rapidly building digital literacy. Innumerable challenges have been met with solutions during the past year. Global higher education is now positioned to study these solutions, learn from them, and quickly scale the implementation of tools, policies, and practices to effectively combat the new digital divide.

HEIs around the world must expand curricular and integrated programs of study that **foster digital literacy in all students**. At the same time, programs to cultivate digital literacy skills, alongside support and training in evidence-based pedagogies for technology-enhanced teaching, must become more widely available to faculty. Many of these programs were implemented for the first time or expanded during the past year's pandemic.⁵⁸

56 — Smidt, E., Li, R., Bolton, D., & Rinehimer, E. (2021). Faculty experiences during the COVID-19 pandemic forced transition to remote teaching: Impact on future faculty support and development. In E. Langran & L. Archambault (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 295-303). Association for the Advancement of Computing in Education (AACE). Retrieved from <https://www.learntechlib.org/primary/p/219145/>

57 — Tugend, A. (2020). *On the verge of burnout: Covid-19's impact on faculty well-being and career plans*. The Chronicle of Higher Education. Retrieved from https://connect.chronicle.com/rs/931-EKA-218/images/Covid%26FacultyCareerPaths_Fidelity_ResearchBrief_v3%20%281%29.pdf

58 — Ibid.

HEIs would benefit considerably from **institutionalizing this expansion and deepening its reach**. It is, indeed, vital that HEIs prioritize access to training opportunities for all faculty, regardless of academic precarity. As HEIs foreground faculty development in diverse competencies, including evidence-based instructional practices, e-learning tools and strategies, digital literacy, and the curricular approaches that foster digital literacies in students, faculty will be empowered both to teach more effectively using technologies and to encourage the development of digital literacy in their students.

While institutions are unevenly prepared to develop digital literacy skills in their students and faculty, many new approaches to combat the digital divide have been piloted, extended, and improved since the onset of the COVID-19 pandemic. Numerous programs designed to promote digital literacy and e-learning proficiency already exist in departments, institutions, and regional systems. The pandemic sparked an incredible proliferation of these programs and has presented a tremendous opportunity to expand our global capacity for digital literacy. **Continuous, evidence-based improvement** of existing programs is vital if we are to capitalize on this moment. Collaboration across institutions and systems will ensure that the work that has gone into developing these programs and structures will not be in vain and **benefit institutions across multiple regions and sectors**.

Onboarding of new faculty at all institutions can and should incorporate supportive training and structural support, which can both cultivate the development of digital literacy skills in faculty and teach faculty how to foster these skills in their students. This support must be well-integrated into academic jobs to lower barriers to access faced by precarious and under-resourced academics. Ph.D.-granting programs can and should incorporate training in evidence-based pedagogy and digital literacy to produce novice postsecondary educators already equipped with vital skills. Training should also model best practices and the use of the sciences of learning and motivation. While they may require more time and resources to develop and administer, educators implement novel pedagogies and practices more effectively when they have experienced these pedagogical approaches themselves as students.

The new digital divide, like so many of the challenges we face today, is transnational and **requires new institutional and human capacities** to address. Communities of practice and learning communities centered on developing digital pedagogies and digital literacies can crosscut HEIs globally. Promoting collaborative practices, co-developing courses, and co-teaching can reduce the digital divide and provide support for the most under-resourced institutions, faculty, and students across the globe.

3.4 Virtual Collaboration

Mobility Remains, Mobility Patterns Change

Throughout history, higher education has developed as an international industry due to its pursuit of universal knowledge and the intended exchange of ideas between often-mobile students and scholars. In the last half-century, the **discourse of internationalization** has gradually changed, exhibiting a palpable shift from the mere development of cooperation to an exchange of students and teachers, collaborative curriculum development, and even active transnational education.⁵⁹ In recent years, an important goal has been to answer the question of how international collaboration and student mobility can be enhanced through digitalization. Meanwhile, innovation concerns, increased awareness of the importance of digital skills for contemporary (work) life, and climate policies have triggered many initiatives.

59 — de Wit, H. (2013). *An introduction to higher education internationalization*. Centre for Higher Education Internationalisation (CHEI). Retrieved from <https://citeseerx.ist.psu.edu/viewdoc/download?>

In light of the COVID-19 pandemic, further developments can be observed in the discourse on the digitalization of higher education in Germany and elsewhere. An unprecedented acceleration of the **implementation of digital communication tools** has been documented in everyday practice. Education systems and the labor market have faced numerous challenges in transforming established processes on short notice and across country borders via digital alternatives. The global pandemic also severely affected international student mobility, particularly due to the closure of many university campuses and the imposition of international travel restrictions. Even under these constraints, however, demand for overseas study continued unabated, and many students were prepared to start their study abroad experience via an online program or to complete it digitally. This indicates the critical role digital formats and tools can play in maintaining international academic exchange in situations of high uncertainty.

Given the positive experiences of the past two digital semesters, a **trend toward hybrid formats** can be anticipated for the future. After some years of successful digital cross-border education, it might even become difficult to argue for “physical only” interactions again. The importance of such questions will be further amplified by concerns regarding sustainability and environmental issues related to international travel.

Toward New Forms of Mobility

It is vital that we capitalize on the digitization push of the last few months and consistently carry it forward toward a more **diverse portfolio of mobility-related offerings** grounded in what we know from the sciences of learning and development. The COVID-19 crisis has created conditions that have opened new possibilities for re-envisioning international mobility and intercultural exchange via digital presentation. With its various online and offline teaching elements, blended learning becomes “blended mobility” when digitally aided instruction is augmented by collaborative components in an international context. The result can be entirely new teaching and learning arrangements that are student-focused, collaboration-based, and unimpeded by geographic or time restrictions, for instance, via peer learning activities or shared material development. Research orientation and project work are examples of didactic approaches that can **provide structure to virtual exchange scenarios and cultivate a network** between instructors and students. Very different combinations of international education delivery can be expected. Some options include completely virtual study and research stays abroad from the participants’ current country of residence as well as combined virtual/physical stays abroad apart from traditional internationalization measures. In addition, virtual campus tours, online self-assessments, virtual preparation, and virtual alumni activities are all offerings that future student generations will increasingly expect.

The new generation of the Erasmus+ program for 2021–2027 considers these developments by taking measures that ensure the implementation of the minimum requirements for the digital management of mobility. Furthermore, digital learning and exchange formats are supported through the promotion of “blended mobility” and “blended intensive” programs. The **potential of virtual configurations** is particularly compelling for short-term exchanges. Meanwhile, the DAAD is broadening its funding guidelines and programs with new offerings and pilot projects to leverage the potential of digital formats and tools. When it comes to student exchange, however, the immersive experience abroad will continue to be of unique value. Thus, both of the following are true: Exchange is possible without mobility, but digitization alone is not enough to replace mobility.

Although mobility patterns may change, we can expect mobility to remain. Recent data from the DAAD and the University Application Service for International Stu-

dents (Uni-Assist) suggest that international students' interest in studying in Germany has remained high even during the COVID-19 pandemic.⁶⁰ A **trend toward greater regional mobility** has been evident for some years now. This is particularly true in Asia, where new high-performance university locations, attractive for students from the region, are emerging in China, Singapore, and Malaysia. Regional mobility helps reduce costs and gives students greater security that they will be able to return home on short notice if necessary. It is, therefore, quite conceivable that the increasing vulnerability to crises will reinforce the trend toward regional mobility.

60 — DAAD & Uni-Assist (2020). *Worldwide interest in Germany remains high* (Press release). Retrieved from https://www.daad.de/en/the-daad/communication-publications/press/press_releases/weltweites-interesse-an-deutschland-ungebrochen-gross/

Collaboration as the New Currency

Throughout history, international collaboration has grown to be an essential pillar of education and science. The current pandemic has again shown the imperative of **addressing global issues in a collaborative manner**. Similarly, the field of higher education has increased its efforts to share knowledge and assets across borders, including via digital formats. Of course, while significantly accelerated by the pandemic, the movement toward more internationally collaborative higher education had begun long before the first COVID-19 restrictions were implemented. Nonetheless, as awareness of new, digitalized formats increased, HEIs worldwide began recognizing their potential and strategically integrating them into their processes.

Indeed, the basic currency of internationalization has changed. Whereas mobility had previously been considered the central unit by which international activities could be measured, **the new currency of academic exchange is now collaboration**. International exchange is not primarily about traveling from place A to place B but about working together to achieve common goals. How this is done—whether via digital collaboration, through the joint creation of documents, at meetings, via video conferencing, or with the help of virtual reality goggles—is secondary. In other words, physical mobility remains one way to collaborate, but there are many others. Although these various methods may not always be equivalent in terms of quality, they may be more cost-effective and efficient and, therefore, more continuous. Moreover, digital—rather than in-person—international collaboration is the only responsible format to consider in light of global warming and carbon footprints. In any case, digital collaboration should not be seen as an inexpensive or more straightforward version of academic exchange, nor should it be abused in this sense.

Virtual collaboration offers a multitude of opportunities. Some of the most notable offerings include expanded access to information, reduced operating costs, the inclusion of new target groups, new conceptions of academic collaboration, more climate-friendly internationalization, and the modernization of existing infrastructures and processes. Leveraging digital technologies for internationalization enables us to **rethink and redesign collaboration formats**. Online collaboration, for example, can create new, less hierarchical communication structures. The most significant added value, however, is that project-related work on topics can be completed together over more extended periods. The density and intensity of this collaboration enable a quality that goes far beyond what temporary residencies can provide.

At the same time, **virtual collaboration brings a variety of challenges** of a didactic nature (e.g., the complexity of co-teaching, the selection of materials, potential cultural misunderstandings, and the need for language skills and digital literacy instruction and support), a technical nature (e.g., issues regarding security and data protection, the provision of hardware and software for all parties involved, compatibility, and time differences), and a social nature (e.g., the digital divide, shared ethical ideas, institutional practices, and quality assurance).

An additional way to forego students' physical mobility while developing all students' international and intercultural learning is via internationalization of the curriculum (IoC) and internationalization at home (IaH).

At the heart of IoC are choices regarding knowledge, teaching, learning, and assessment. Leask defines IoC as "the incorporation of international, intercultural and global dimensions into the content of the curriculum as well as the learning outcomes, assessment tasks, teaching methods and support services of a program of study" (p. 9).⁶¹ In IoC, the focus should be on developing graduates who see themselves as members of world communities capable of **defining and solving problems across disciplinary and cultural boundaries**. IaH, meanwhile, is classified by Beelen and Jones as "the purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students, within domestic learning environments" (p. 69).⁶² The authors specifically identify the relevance of "local cultural, ethnic or religious groups," thereby highlighting one of the many possible opportunities to work with societal actors for both IaH and IoC.

These concepts are not new. However, they are reinvigorated with contemporary education technology enabling computer-supported collaborative learning (CSCL), which can be integrated into existing IoC and IaH programs and approaches. Further, as virtual collaboration brings numerous challenges, fundamental internationalization efforts at the institutional level can help build necessary knowledge and skills for those looking to collaborate.

These concepts can be combined with more **in-depth insights from learning science** about learning, collaborative learning, and CSCL. First, we know that learning environments must be deliberately selected for different levels of the learning process. In the novice phase of skill acquisition, learners require a higher degree of external instructional guidance because the cognitive architecture underlying human learning becomes overwhelmed when learners cannot rely on a sufficient existing knowledge base. As such, finding a balance between knowledge-based and instruction-provided guidance is necessary for successful learning and student achievement.⁶³ Second, collaborative learning necessitates that learners must communicate and explain their actions in the learning environment, requiring different coordinative and communicative processes, some of which contribute to and some of which inhibit the learning process.⁶⁴ Collaborative learning is thus most effective and enjoyable when tailored to learners' existing knowledge. Third, introducing computers to collaborative learning has positive effects on students' learning processes and outcomes and may help in mitigating some of the additional cognitive load necessary in a collaborative learning setting.⁶⁵ CSCL might, therefore, enable students to get the best of both worlds.

In designing and implementing collaborative learning as part of IaH programs, particular attention should be given to finding **suitable tasks for students at appropriate levels of the learning process**. Learners who are not accustomed to working collaboratively or collaborating with others from very different cultures and contexts might benefit from more straightforward initial projects that focus on building their collaborative "muscles" before advancing toward more challenging tasks. Expectations of learning outcomes must be tailored toward the unique context at hand, especially when such programs include taxing cooperative and communicative tasks across cultures and languages.

61 — Leask, B. (2013). Internationalizing the curriculum in the disciplines—Imagining new possibilities. *Journal of Studies in International Education*, 17, 103–118. DOI: 10.1177/1028315312475090

62 — Beelen, J. & Jones, E. (2015). Redefining internationalization at home. In A. Curaj, L. Matei, R. Pricopie, J. Salmi, & P. Scott (Eds.), *The European higher education area* (pp. 59–72). Springer. DOI: 10.1007/978-3-319-20877-0_5

63 — van Gog, T., Ericsson, K. A., Rikers, R. M., & Paas, F. (2005). Instructional design for advanced learners: Establishing connections between the theoretical frameworks of cognitive load and deliberate practice. *Educational Technology Research and Development*, 53, 73–81. DOI: 10.1007/BF02504799

Kalyuga, S. (2007). Enhancing instructional efficiency of interactive e-learning environments: A cognitive load perspective. *Educational Psychology Review*, 19, 387–399. DOI: 10.1007/s10648-007-9051-6

64 — Janssen, J., Kirschner, F., Erkens, G., Kirschner, P. A., & Paas, F. (2010). Making the black box of collaborative learning transparent: Combining process-oriented and cognitive load approaches. *Educational Psychology Review*, 22, 139–154. DOI: 10.1007/s10648-010-9131-x

65 — Chen, J., Wang, M., Kirschner, P. A., & Tsai, C. C. (2018). The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis. *Review of Educational Research*, 88, 799–843. DOI: 10.3102/0034654318791584

Co-Creation is Key for Innovation

New forms of international collaboration are not limited to students learning in the (virtual) classroom. Virtual exchange formats (examples of good practice—from before the pandemic—can be found in the context of Collaborative Online International Learning⁶⁶ and, more recently, in DAAD's International Virtual Academic Collaboration program⁶⁷) explicitly **foster joint course development and co-teaching** by instructors from partnering institutions. Co-teaching can strengthen and expand upon the collaborative activities of HEIs that, until now, were often limited to (but also thriving within) research collaborations.

New forms of collaboration extend beyond the classroom. Co-developed and co-taught formats also require coordinating the underlying infrastructure, course support, and administration of students. In this way, virtual exchange formats have the potential to contribute not only to intensifying collaboration between institutions but also to navigating intercultural or interdisciplinary challenges (for example, divergent approaches to teaching and learning or subject-specific views) and further developing competencies within the organizations' staff. In addition, new (digital) forms of collaboration offer possibilities for HEIs to **create new international offerings**. The European Universities Initiative is testing different cooperation models that foster collaborative efforts among European universities so that they can become inter-university campuses around which students, doctoral candidates, staff, and researchers can move seamlessly. Participating universities will pool their expertise, platforms, and resources to deliver joint curricula or modules covering various disciplines. This level of cooperation makes systematic recognition of partner institutions' qualifications essential and thus positions the European Universities Initiative as a catalyst for mutual recognition and greater collaboration across the European Higher Education Area.

Collaborative approaches also further enable innovation in learning and teaching in the form of OEPs. OEPs use OERs that are developed with community stakeholders in a way that allows for the material to be shared openly with other practitioners online and adapted and repurposed for different contexts. This **fosters a perspective on the curriculum** not as something that educationalists provide but rather as something that emerges as learners engage with one another and the subject matter within an educational context.

New formats and areas of (virtual) collaboration have the potential to redesign and support internationalization efforts across HEIs. As such, a strategic approach is required at the organizational level to **leverage these tremendous possibilities** at scale.

66 — de Wit, H. (2013). An introduction to higher education internationalization. Centre for Higher Education Internationalisation (CHEI). Retrieved from <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.905.8413&rep=rep1&type=pdf>

Jager, S., Peng, H., Alba Duran, J., & Ogge1, G. (2021). *Virtual exchange as innovative practice across Europe: Awareness and use in higher education: EVOLVE project monitoring study 2020*. Retrieved from <https://research.rug.nl/en/publications/virtual-exchange-as-innovative-practice-across-europe-awareness-a-2>.

67 — See: <https://www.daad.de/en/information-services-for-higher-education-institutions/further-information-on-daad-programmes/ivac/>

4 Recommendations

4.1 Leadership: Digital Learning Transformation at the Institutional Level

1. Anchor digital learning in the **strategy, structure, and culture** of HEIs and create a clear responsibility for digital learning at the leadership level. In addition, understand the digital transformation of institutions as a holistic phenomenon that includes various context-specific solutions for research, teaching, administration, and management.
2. Align digital learning strategies with their purpose by establishing an institutional **mission** that harnesses the equalizing power of digital education and integrating change management that moves the education industry from a legacy industry to a transformed and continuously improving digital knowledge enterprise.
3. Ensure that **decision-making processes** regarding digital learning are inclusive of all internal stakeholders (students, teaching staff, researchers, administration, and leadership) and strive toward new forms of organization and participation.
4. Build **short innovation cycles** into the strategy, structure, and culture of HEIs to allow for the continuous monitoring, evaluation, and implementation of digitalization efforts.
5. Make **digital leadership**, including the use of new communication channels, a practical understanding of the evidence about learning and motivation, transparency of decision-making processes, and direct exchange with internal stakeholders, a requirement for all HEI leaders. Digital leadership skills should be offered as upskilling and training to leadership personnel.
6. Guarantee that decisions concerning digital learning are **research-based**. Utilize expertise from learning and digital learning scientists and, where possible, learning labs within the institution, and engage these experts in a continuous improvement process grounded in evidence gathered from courses and programs themselves.
7. **Collect and analyze data** related to the transformation and delivery of courses and efforts to enhance faculty members' digital literacy and pedagogical rigor. This can and should serve as the foundation for the continuous, evidence-based improvement of existing programs and receive support from the institutional leadership level.
8. Ensure that HEI leaders, in collaboration with the technology sector, are aware of their **role as change makers** in negotiating conditions that have implications for other institutions. Collaborate with other educational institutions to collectively negotiate terms that serve open education and equitable access goals.
9. Secure financing through **sustainable financial planning** between the HEI management and faculties/departments. Particularly for smaller HEIs, this can also be facilitated by developing and using a joint infrastructure in cooperation with other HEIs.
10. Recognize that HEIs play a crucial role in supporting (national) **digital literacy** strategies for all citizens, and consider implementing mandatory training in digital literacy for all members of the institution while also offering voluntary training of digital literacy for external persons.
11. **Incorporate training** in digital literacy, learning science, and evidence-based, technology-enhanced pedagogies into new faculty onboarding at postsecondary institutions, and train institutional faculty explicitly in integrated curricular design to foster digital literacy skills in students at each institution.

12. **Monitor systemic inequalities** that afflict disadvantaged socioeconomic groups (e.g., low-income earners, women, and minoritized groups), and design and implement appropriate support structures, including mental health support, childcare, mentoring, etc. Consider designing and administering such support structures as shared services within the higher education sector.
13. Offer **internationalization at home opportunities** that provide culturally sensitive teaching at the home institution to promote alternative academic discourse and enable students to partake in digital learning programs at—or in collaboration with—other institutions. This will likely require establishing organizational structures, accountability, evaluation, and incentive systems that are aligned with these goals.

4.2 Policy: Digital Learning Transformation at the Nation-State Level and Beyond

1. Recognize that the **digital transformation of higher education** will require extensive political support, and consider creating additional funding schemes to advance the transformation process.
2. Anchor **digital learning in national policies** and create a clear responsibility for digital learning at the policy level.
3. **Tackle systemic inequalities** in technology and infrastructure. While these do not necessitate high-tech solutions and can be realized as frugal innovations, the provision of basic infrastructure is the responsibility of policy makers to ensure that all citizens have access to education.
4. Challenge the systemic inequalities affecting disadvantaged socioeconomic groups (e.g., low-income earners, women, and minoritized groups) by monitoring and redesigning existing **support structures** to resonate with and integrate the lived experiences of additional sub-groups of traditionally underrepresented groups, thus creating pathways to advanced skills.
5. Create a **digital literacy strategy for all citizens** and inaugurate (national) policies that develop digital literacy at all stages of the education system.
6. Create and foster **involvement in learning networks at the national level** to identify best practices and develop joint regional solutions.
7. Establish and cultivate **involvement in learning networks at the international level** to jointly develop digital teaching and learning strategies, virtual collaboration, and internationalization approaches.
8. Initiate **communities of practice and learning** centered on developing digital pedagogies grounded in insights from learning sciences and digital learning communities to foster skill-building and collaborative approaches.
9. Build structures that support **open education efforts**, including infrastructure, resources, mindset and culture, policies, practices, communities, and legal frameworks for digital learning needs.

4.3 Industry: Responsible Technology Innovation for Digital Learning

1. Foster **close relationships with HEIs** to ensure that learning outcomes align with the changing requirements of the modern workforce. The required digital transformation involves much more than tools. Rather, it is a complex endeavor that necessitates the coordination of people, processes, existing science, and tools.
2. Create **career paths that facilitate an exchange** of personnel between higher education and industry to create deeper knowledge transfer and collaboration. With regard to digital transformation processes, the higher education landscape may benefit from fresh ideas concerning change management, new business models, flat hierarchies, and agile workflows.
3. Invest in **corporate ventures** that address specific digital learning and teaching needs. Established leaders of the industry may not be able to solve all conditions of the education sector but can orient themselves toward the individualized solutions of smaller start-ups.
4. Identify effective **business models for open education**.
5. Recognize that different regions have different understandings of data protection and privacy laws and orient educational products toward **universally applicable data privacy** laws to make them accessible to users of all areas.
6. Ensure the **affordability of technological products for the end user** by considering frugal innovation for hardware as well as the compatibility of software on mobile devices or low broadband service.
7. Reach out to learning scientists and employ **research-based approaches** to include them in designing educational technology solutions.
8. Design services and products that are **barrier-free and focus on cultural inclusion**. Learning and teaching must provide adaptable, individualized solutions to ensure equal access to all learners with diverse needs.