Digitalisation, Inclusion, and Exclusion in Higher Education

Digitalisation, Inclusion, and Exclusion in Higher Education:

Reflections on Theory and Practice

Edited by

Juliette E. Torabian, Andreas Hadjar and Auli Toom

Cambridge Scholars Publishing

Digitalisation, Inclusion, and Exclusion in Higher Education:
Reflections on Theory and Practice

Edited by Juliette E. Torabian, Andreas Hadjar and Auli Toom

This book first published 2025

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-0364-4742-7
ISBN (Ebook): 978-1-0364-4743-4

TABLE OF CONTENTS

Appendices

LIST OF ILLUSTRATIONS

LIST OF TABLES

Chapter Three

Chapter Six

PREFACE

This collected volume of double-blind peer-reviewed chapters focuses on digital justice in, for, and by higher education.

Recognizing that the digital realm is not a neutral space, but a reflection and reproduction of existing power dynamics, representations and social stratifications, this book delves into theoretical as well as practical ways technology can both exacerbate and alleviate forms of exclusion and inequality in the globalized higher education.

In this brief preface, I share a few reflections explaining the rationale behind this book project and how each chapter contributes to its overall aim.

The Promise and Peril of Digital Higher Education

The proliferation of digital technologies, such as online learning platforms, educational apps, and learning analytics, has radically transformed the higher education landscape globally. These innovations- that are unsettling the already shifting higher education due to global rankings and the race for global excellence and student retention- are seemingly opening new avenues for expanding access to educational opportunities, enhancing pedagogical approaches, and personalizing the learning experience for students (Resta et al. 2018).

The shift towards digital education is widely presumed to have the potential to democratize learning and to provide better opportunities for academic research and publication. The learning democratization claims entail providing previously underserved populations - including those from low-income backgrounds, remote rural communities, or with disabilities - with access to high-quality educational resources and opportunities that were once out of their reach. Moreover, the flexibility and scalability of digital learning modalities are believed to enable higher education institutions to reach students across geographic boundaries, effectively bridging longstanding gaps in educational access and delivery that have historically marginalized certain demographic groups (Devaux et al. 2017). The academic and publication democratization claim entails better and equal opportunities for academics and researchers from different parts of the world to publish their studies in high quality scientific journals hence closing the historical gap of knowledge production between the global

North and the South. In short, the digital transformation of the higher education sector holds promises for fostering a more inclusive and equitable educational landscape, empowering a diverse array of individuals to engage with and succeed in academia and beyond.

These assumed benefits of equality and social justice through digitalization of (higher) education are mostly emphasized by the United Nations, while the Organization for Economic Co-operation and Development (OECD) primarily focuses on the economic development benefits of digital education.

Indeed, the digital transformation of higher education holds the promise of boosting global and national economic development by equipping students with the skills and knowledge needed to thrive in an increasingly technology-driven, knowledge-based economy. The OECD emphasizes the crucial role of higher education in cultivating the human capital necessary to drive innovation, productivity, and economic growth in the 21st century (Pereira 2016) . This is in line with the Fourth Industrial Revolution (4IR)- a concept developed by the World Economic Forum (WEF 2017)- which has ushered in rapid technological advancements that are dramatically reshaping the global workforce and labor market. By leveraging digital technologies to enhance teaching and learning in the context of the 4IR, the OECD inseminates higher education institutions with vocational priorities that are to help students develop the specialized technical expertise, and adaptability required to succeed in this new economic landscape and contribute to their countries' long-term competitiveness and prosperity.

However, the picture painted by the above two claims seem to be rather sugar-coated and uneven, if not unrealistic. The digital transformation of societies and of higher education have also revealed and exacerbated existing inequities, creating new forms of exclusion and marginalization (Warschauer, Knobel, and Stone, 2004). The *digital divide*, i.e., the gap between those who have access to and can effectively utilize digital technologies and those who cannot, has become a significant barrier to educational equity across all levels of education including higher education. Students from socioeconomically disadvantaged backgrounds, racial and ethnic minorities, and those living in remote or underserved areas often lack access to reliable internet connectivity, devices, or digital literacy skills, limiting their ability to fully participate in and benefit from technology-enabled learning. (Resta et al., 2018; Caparas and Yango, 2023). These disparities in digital access and competencies can, in turn, translate into substantial differences in educational outcomes, with technology-enabled learning often amplifying the existing achievement gaps between privileged and marginalized student populations. The knowledge production gap

between developing and developed countries—although our definition of development itself requires a revolutionary revision, which I am contemplating in my upcoming book—remains unresolved, as predatory journals continue to exploit researchers, dilute academic integrity, and reinforce systemic inequalities in global scholarship.

The key question, therefore, is to what extent the collective imagination of digital higher education—as a supposed magic bullet for inclusion and equality—aligns with reality, and whom it ultimately serves. As higher education institutions increasingly integrate digital technologies into their pedagogical approaches and service models, it is essential to critically examine the intricate relationship between digital transformation and social justice, ensuring that technological advancements do not inadvertently reinforce existing inequalities.

The primary motivation behind this book, therefore, is to explore how digital innovation in higher education can be harnessed to foster greater equity, inclusion, and social justice for researchers, faculty members, and students. At the same time, it critically examines how technology-enabled education might inadvertently reinforce or widen existing disparities. All contributors to this volume share a foundational perspective: social justice in digital higher education is a complex and evolving concept that encompasses equitable access to digital resources, inclusive representation in academic spaces, meaningful participation in knowledge production, curriculum design, teaching practices, pedagogies, and the lived experiences of students and academics in learning, research, and publishing. In an increasingly globalized higher education landscape, digital transformation presents both opportunities and challenges for advancing social justice, warranting deeper scrutiny—an endeavour we collectively undertake in this book.

The organization and content of this book

Alongside the digital divide, the book also examines the concept of digital equity, which emphasizes the need for equal opportunities to effectively leverage digital technologies for learning, social participation, and personal advancement. Digital equity encompasses not only access to hardware and software, but also access to meaningful, culturally relevant digital content and skilled educators who can guide students in the use of digital tools.

The contributors to this book grapple with these complex issues, drawing on research and experiences from a range of contexts including from Finland, Germany, Sri Lanka, Switzerland, Taiwan, and the US. They explore how digital higher education can reinforce or disrupt patterns of

exclusion and provide insights into strategies for promoting more equitable approaches to the integration of technology in higher education settings from classroom pedagogies to teacher education and publishing.

The book is divided into three sections. The first section “the frames” is dedicated to theoretical and conceptual discussions and contains two chapters. This is followed by a section on “the divide” with three chapters and a final section called “the bridge” with three chapters. Below, each of the sections and their chapters are briefly discussed to help readers with a better understanding of the content of this volume.

The Frames

This section covers the theoretical and conceptual discussions that examine digital divide and digital equity. Adapting a social justice perspective with the assumption that equality in access, participation, opportunities, and outcomes shall be an integral part of policies and practices in higher education, this section includes two chapters.

In the first chapter, *Hadjar, Torabian & Toom* provide a comprehensive analysis of the multifaceted nature of the digital divide, extending beyond a narrow focus on technology access to explore the nuanced issues of digital skills, usage patterns, and the resulting societal consequences. Recognizing the complexity of this challenge, the chapter introduces a multilevel framework that considers individual, community, and societal factors in decoding the global digital divide. This multilayered approach is argued to enable a more holistic understanding of the digital divide, capturing the interplay between personal, local, and broader structural elements that contribute to unequal access and utilization of digital technologies.

Moreover, the chapter emphasizes the critical need for longitudinal research to track the evolving nature of digital inequalities across different generational cohorts, acknowledging that distinct age groups often develop divergent digital skills and preferences, which can exacerbate the digital divide. Finally, the authors call for the implementation of policy interventions at various levels - individual, community, and societal - to holistically address these digital inequalities and promote greater digital inclusion. These multi-pronged, coordinated efforts are reckoned crucial to ensuring equitable access, developing digital competencies, and meaningfully integrating technology across all segments of the population.

In the second chapter of the frames’ section, *Magno and Becker* examine the CELL project as a digital post humanist assemblage, exploring how the creators' mindsets and experiences shape the project's framework. It underscores the pivotal role of digital technologies in molding the content,

the users, and the future of educational technology. The authors emphasize the entanglement of digital technologies with algorithmic systems, which impact and are impacted by individuals and social developments. The CELL project, led by the authors at the University of Fribourg Switzerland, is described as culturally diverse and focused on social justice. It utilizes digital learning materials to capture local voices and knowledge but acknowledges the challenge of ensuring equal representation and user engagement with complex content. The rhizomatic arrangement of human and non-human entities within the CELL allows for a diverse collection of artifacts, fostering intra-actions and transcending barriers between humans and nonhumans.

The chapter further delves into the various challenges faced by the CELL project, including the digital divide, language barriers, cultural representation, financial constraints, technological limitations, ethical and representation issues, user engagement, and the exclusion of certain voices. These challenges highlight the complexities of creating an inclusive and accessible digital learning platform that addresses the digital divide and promotes social justice. The project's creators recognize these limitations and continue to explore ways to address them, acknowledging the ongoing work required to establish truly equitable and representative digital educational resources.

Both chapters provide insights into the complexities of achieving social justice in digital higher education, the first by examining the benefits of multi-level and life course research approaches and the second by reflecting on a real and ongoing project, i.e., CELL and the complexities of human and non-human digital project design that is shared across different cultural and linguistic contexts.

The Divide

This section of the book focuses on empirical studies from different contexts that depict the sources and forms of digital divide in globalized higher education.

In the first chapter of this section, *Allen and Chan* explore the complex interplay of pressures and vulnerabilities that contribute to the rise of predatory publishing in Taiwanese academia. The study focuses on the intense pressure faced by Taiwanese researchers to publish in internationally recognized, often English-language, journals to enhance their career prospects and contribute to their universities' global standing. The authors analyze university responses to a national scandal involving predatory

publishing, revealing how the pursuit of global prestige within a competitive academic landscape can inadvertently create vulnerabilities for researchers.

The study argues that this vulnerability stems from a form of "digital exclusion". While seemingly paradoxical in a digitally connected world, this exclusion refers to the lack of access to legitimate and reputable publishing avenues, coupled with insufficient training and support in navigating the complexities of scholarly communication. This lack of access and training leaves researchers ill-equipped to discern credible journals from predatory ones, increasing the likelihood of publishing in outlets that offer little to no academic rigor or quality control. Ultimately, the authors highlight the urgent need for increased support, resources, and training within the Taiwanese higher education system to address this issue and empower researchers to make informed decisions about where they publish their work.

In the second chapter of this section, *Lanford and Huang* conduct a comparative research study adopting a constructionist epistemological approach to investigate the multifaceted digital divide experienced by rural students. Through in-depth case studies conducted at two rural universities in the Southeastern United States, the study identifies four key barriers: limited digital skills and literacy among the student population, a lack of meaningful engagement and participation in digital learning environments, restricted digital social networks and support systems, as well as institutional and governmental policies that inadvertently hinder access to digital resources and opportunities.

Acknowledging these concerning trends, the study emphasizes the urgent need for targeted interventions and support mechanisms to address these challenges. Recommendations include initiatives to enhance rural students' digital literacy and skills development, foster greater engagement and community building within digital learning environments, and work to dismantle institutional and policy-level barriers that perpetuate the digital divide. The findings of this study reveal how these interrelated barriers not only restrict the overall access of rural students to digital technologies but also exacerbate existing educational inequalities between rural and urban students.

In the final chapter of this section, *Torabian* examines the complex and multifaceted issue of the digital divide in higher education focusing on sources and forms of digital inequality. The author delves into the intricate web of societal, geographical, economic, and educational factors that collectively contribute to the perpetuation of this divide, including entrenched socioeconomic disparities, inadequate digital infrastructure in many regions within countries and across different regions of the world, and

a persistent lack of essential digital literacy skills among various segments of the population based on their socio-cultural norms.

The chapter underscores the critical importance of implementing comprehensive, evidence-informed initiatives that tackle the digital divide from multiple angles, addressing not only the technological barriers but also the underlying socioeconomic and educational inequities. Referring to a few global and regional initiatives for digital inclusion, the author stresses the necessity of fostering global cooperation and securing sustained commitment from governments, educational institutions, and other key stakeholders to ensure equitable access to digital technologies and high-quality higher education opportunities for all individuals, regardless of their socioeconomic background or geographic location. Only through such concerted, multilateral effort, the author asserts, can we begin to dismantle the deep-rooted systemic challenges underlying the digital divide and work towards a more inclusive and just digital future in higher education.

These three chapters delineate the digital divide and its impacts on both students and researchers. Collectively, they provide an overview of the ways social disadvantages- caused by gendered norms, geographical, socio-economic, cultural and urban-rural divides- are replicated in digital higher education hence emphasizing the necessity of social policies and international initiatives that reduce inequalities within and across countries.

The Bridge

This final section of the volume includes case studies showing innovative inclusive practices and novel pedagogies and policies that attempt to bridge the digital divide in lifelong adult learning and higher education teaching and learning

In the first chapter of this section, *Hasangani and Ladd* examine strategies to enhance digital inclusion in higher education by focusing on student engagement in online peace education courses. The research was conducted in three Peace Studies courses offered online by the Department of International Relations, Faculty of Arts, University of Colombo, Sri Lanka.

The authors emphasize the benefits of lesson plans that incorporate skills and knowledge identified in job market analysis. They employ a course selection strategy aligned with industry skill requirements and examine educators' reflections on classroom experiences with digital inclusion. Data collection methods in this paper include individual educator self-reflexivity, incorporating observations and insights related to each phase, with a specific emphasis on the nuances of student engagement.

The study identifies key themes impacting inclusivity in digital classrooms: improved classroom context, addressing student feelings, strategic activity timing, and novel activity designs. The authors then suggest- and rightfully too- that educators should consider classroom context, student feelings, activity timing, and activity design to promote self-directed learning. The chapter highlights the importance of adjustments to ensure inclusivity in digital learning environments and suggests further exploration of various types of adjustments and their contribution in addressing disparities in access to digital technology.

In the second chapter of this section, *Homrighausen, Martens, Quenzer-Alfred, Bruns, Kamin & Mays*, provide a comprehensive examination of the development and evaluation of two innovative didactic concepts aimed at integrating digital tools into inclusive teaching practices in Germany.

The first concept involves a self-learning unit designed to equip prospective teachers with the digital competencies necessary to address diverse learning needs and promote inclusivity in the classroom. The unit helps teachers acquire a range of skills, from leveraging digital technologies to support students with varied learning styles, to developing strategies for managing heterogeneity in the classroom. The second concept, the "Digital Inclusion Toolbox," offers a rich collection of resources, including case studies, digital tools, and lesson planning approaches, to further support inclusive teaching practices.

The chapter delves into the structure and content of both concepts, presenting a detailed framework and the results of their evaluation. It highlights the effectiveness of the self-study course in enhancing teachers' digital capabilities, as well as the promising potential of the Digital Inclusion Toolbox to foster inclusive digital learning in teacher education programs. This work underscores the crucial role of equipping pre-service and in-service teachers with the necessary digital skills and pedagogical strategies to create inclusive learning environments that leverage technology to support diverse learners.

The final chapter of this section is authored by *Ilomäki, Gedrimiene, Henning, Silvola, Muukkonen & Lakkala* from Finland.

Their chapter provides a comprehensive examination of the digital divide among higher education students and showcases innovative examples of Finnish higher education courses designed to address these pressing inequalities. The authors argue that while many students may possess a foundational level of digital skills, they frequently lack more advanced and specialized competencies in crucial areas such as data literacy, information literacy, AI literacy, and a deeper understanding of the broader societal implications and impact of digital technologies.

To tackle this challenge, this chapter highlights four pioneering courses that aim to cultivate these critical digital literacies among students. These courses focus on developing students' proficiency in the effective and responsible use of technology, fostering data-driven decision-making abilities, and promoting digital citizenship - all with the overarching goal of enhancing equitable access and opportunities in the digital age. By offering these enriched learning experiences from the Finnish higher education system, this chapter highlights the ways students may be empowered to navigate the complexities of the digital landscape and how technology can be a transformative tool for social progress and inclusive development. The article emphasizes that simply having access to digital devices and the internet is no longer sufficient to ensure equity in the digital age.

The chapters in this section share invaluable insight on the ways digital technology can effectively be used to tailor training and learning and to create inclusive and equitable learning opportunities for all.

Collectively, the eight chapters in this book offer a nuanced understanding of the relationship between digital higher education and social justice, providing a foundation for scholars, policymakers, and practitioners to work towards a more equitable digital future for post-secondary education.

A final note: I would like to thank, first and foremost my co-editors, Andreas Hadjar and Auli Toom who, accepted to accompany me through different stages of this book- from when I shared my rough idea with them at the final conference of our EU-funded RIA project PIONEERED to reviewing chapters and managing external reviews. I am also grateful to all colleagues and authors of the chapters from different countries and regions of the world who agreed to participate in this project sharing their insights and research outcomes that render this book a unique contribution to the field of sociology and higher education studies. Their proposals were cherry-picked for this volume as we initially received a high level of interest. The selection of authors was based on their academic vigor, clarity of arguments, and the significance of their research. It is a pleasure to know that colleagues from different contexts and at different stages of their academic life have been able to be part of this book project. Finally, my special thanks go to colleagues at Cambridge Scholars Publishing as well as my close family & Mr. Bijou who- for a third time- tolerated the author in the household and her lack of time, nocturne notetakings, and usual absences from family occasions to write, edit, and lead this book project.

Juliette E Torabian
May 2025

References

Caparas, Marie, Shienna, and Antonio R. Yango. 2023. "Digital Divide, Digital Equity, and Online Learning Engagement Among Selected College Students in Pamantasan ng Cabuyao" 44: 206-219. https://doi.org/10.47577/tssj.v44i1.8937.

Devaux, Axelle, Julie Bélanger, Sarah Grand-Clément, and Catriona Manville. 2017. "Education: Digital technology's role in enabling skills development for a connected world" https://doi.org/10.7249/pe238.

Pereira, Álvaro. 2016. "Skills for a Digital World" https://doi.org/10.1787/5jlwz83z3wnw-en.

Resta, Paul, Thérèse Laferrière, Rob McLaughlin, and Assetou Kouraogo. 2018. "Issues and Challenges Related to Digital Equity: An Overview" Springer Nature (Netherlands): 987-1004. https://doi.org/10.1007/978-3-319-71054-9_67.

Reich, Justin, Ito, Mizuko. 2017. "From Good Intentions to Real Outcomes: Equity by Design in Learning Technologies"

Warschauer, Mark, Michele Knobel, and Lee Ann Stone. 2004. "Technology and Equity in Schooling: Deconstructing the Digital Divide" SAGE Publishing 18 (4): 562-588. https://doi.org/10.1177/0895904804266469.

WEF. 2017. "An Agenda for Leaders to Shape the Future of Education, Gender and Work"

SECTION ONE

THE FRAMES

CHAPTER ONE

THE DIGITAL DIVIDE: THEORETICAL APPROACHES AND STATE-OF-RESEARCH

ANDREAS HADJAR, JULIETTE E. TORABIAN AND AULI TOOM

Introduction

In recent years, many public debates and scientific studies have focused on digitalization, its significance and impacts across different spheres of societies and fields of research (e.g., van Dijk 2005). However, the digital divide within and across countries is a topic that came to the fore again into scientific consciousness when the COVID-19 pandemic in 2020 led to the closure of schools, universities and other educational premises, and as all learning and teaching processes were reduced to the digital world. As Van de Werfhorst et al. (2022, 1) also indicate: "a coincidental, but nevertheless highly influential byproduct of the COVID-19 pandemic is that inequalities in digital skills and usage, as well as inequalities in the effects thereof on students' educational outcomes, may be enlarged."

Even before the COVID-19 pandemic, scholars and policymakers in various regions had underscored the significance of digital competencies or digital literacy skills among young people, emphasizing the need to support their learning throughout the educational trajectory and acknowledging how the uneven acquisition of these capabilities can be attributed to the diverse contexts and circumstances in which youth are situated (e.g., Ilomäki, Paavola, Lakkala & Kantosalo 2016; Ilomäki, Lakkala, Kallunki, Mundy, Romero, Romeu & Gouseti 2023; European Commission 2010) . It soon became apparent that individuals with higher levels of digital literacy were better equipped to cope with the limitations imposed by the pandemic and to navigate their general life course development, in contrast to those lacking digital knowledge and skills. The digital divide, a new type of

inequality (Korupp & Szydlik 2005), pertains to the resource gap between those who are familiar with and possess sufficient digital knowledge and skills, and those who are unfamiliar with and exhibit deficiencies in the knowledge and skills necessary to understand and engage in digital activities.

It is important to clarify that digital resources can represent both an *axis* and a *dimension* of inequality. As an axis of inequality, disparities in internet access, digital participation, and digital literacy shape unequal life opportunities, such as in education, networking, and the labor market. Conversely, digital resources can constitute a dimension of inequality, as other forms of inequality based on factors like socioeconomic status, gender, or disability also influence access, skills, and participation in the digital realm.

This chapter will present a four-dimensional framework for conceptualizing digital inequalities, drawing on the arguments advanced by Van de Werfhorst et al (2022). This theoretical perspective is grounded in the sociology of education and its central areas of interest regarding the digital divide. These include differences in access to digital resources across various groups, countries, and regions; variations in patterns of digital participation and usage among distinct populations; and disparities in digital literacy, skills, and knowledge that impact opportunities for digital engagement.

In this chapter, we will first present definitions and theoretical approaches to conceptualizing digital inequalities. We will then examine the current state of research in this area to provide a conceptual foundation for the subsequent chapters of this book- which focus on the intersections of digitalization, higher education, and social justice.

Theorizing digital inequalities

The concept of the digital divide is closely tied to theories of inequality and social inclusion/exclusion. As Castells (2001) has identified, the divide between those with and those without internet access, or between the digitally literate and the digitally illiterate, constitutes an additional source of inequality and social marginalization. Drawing on definitions of inequality more broadly, the digital divide refers to systematic disparities in resources that lead to subsequent variations in life chances, often resulting in short-term and long-term disadvantages for certain social groups. As emphasized in a blog post by the University of Edinburgh (2020), the dimensions of exclusion identified by Burchardt et al (2002, 31) are all, therefore, applicable to the digital realm.

Exclusion from the digital realm becomes a major cause of inequalities, as it impacts an individual's ability to purchase goods and services, participate in the economy, engage in decision-making, and integrate with the community. For instance, a person without internet access or digital literacy is unable to access cheaper online offers or services, cannot work remotely or utilize the internet to facilitate their work, and lacks the political participation opportunities the internet provides for information, debate, and gatherings. Furthermore, such individuals may also be unable to network and maintain social contact through the digital world. Another aspect of this divide is the access to and integration of digital literacy skills within the educational path, including how systematically these skills are taught, how they are incorporated into the school curriculum, and the digital competence and ability of teachers to support this learning (e.g., Gouseti, Lakkala, Raffaghelli, Ranieri, Roffi & Ilomäki, 2023).

Multilevel conceptions of the digital divide from an inequality perspective

The presented conceptual framework for understanding the digital divide in this chapter adopts a multilevel perspective rooted in the "resources and appropriation theory of inequality" proposed by Van Dijk (2005, 2013). This approach moves beyond an individualistic focus on digital access, instead considering how the importance, accessibility, and provision of digital resources within various societal contexts, such as schools, workplaces, and communities, shape individuals' unequal opportunities to participate in the digital world. The “multilayered nature of the digital divide” (Werfhorst et al. 2022) as outlined in this theoretical perspective, underscores how individual-level digital engagement is contingent upon higher-level contextual factors and resources that may differentially advantage or disadvantage individuals across various axes of inequality.

The number of levels in the conceptualization of the digital divide has risen almost chronologically in the literature (two levels: Korupp & Szydlik 2005; three levels: DiMaggio et al. 2004; Scheerder et al. 2017; four levels: van de Werfhorst et al. 2022). The first layer or the primary digital divide relates to *access* to and *availability* of computers and the internet. This foundational level of inequality concerns the uneven distribution of the most basic digital resources and infrastructure across different socioeconomic and geographic contexts. The second layer or the secondary digital divide relates to the *knowledge, skills, and competencies* required to effectively use computers and the internet. This level encompasses not just access, but the differentiated abilities of individuals to navigate, utilize, and benefit from

digital technologies, which can be shaped by factors such as educational background, age, and digital literacy. The third layer or the tertiary digital divide relates to the broader consequences of these digital inequalities, in terms of how differential access and digital skills translate into *unequal outcomes* in the education system, the labor market, and across other life domains. These consequences can further entrench and reproduce social stratification, as those with greater digital resources and capabilities are better positioned to leverage technology to their advantage (Van Deursen & Helsper 2015; van de Werfhorst et al. 2022). The fourth layer, added by van de Werfhorst et al. (2022), encompasses the broader contextual factors that shape digital inequalities beyond just individual-level access and skills. This layer emphasizes how the availability of digital resources and learning opportunities within various *institutional and community-level contexts*, such as schools, workplaces, and social policies, can serve to either exacerbate or mitigate digital divides.

Specifically, the possibilities for developing digital literacy skills within different educational pathways, the digital integration in school curricula, and the pedagogical capabilities of teachers in supporting students' digital skill acquisition are all crucial contextual elements. These higher-level contextual factors function as "compensatory agents" that can work to balance digital inequalities by providing more equitable access to digital resources and learning opportunities (Van de Werfhorst et al. 2022).

For instance, schools can play a key role in mitigating digital divides between students from different socioeconomic backgrounds by integrating information and communication technologies (ICT) into their instructional practices and supporting the development of the digital skill of all learners, regardless of their individual access or prior digital competencies. In this way, the fourth layer highlights how individual digital outcomes are shaped by the interplay between personal digital access, skills, and usage, as well as the digital resources and support mechanisms embedded within the larger environmental contexts in which individuals are situated.

As outlined above, the first two layers of the digital divide framework address dimensions of inequality that are shaped by factors such as social origin and gender, including access to computers and the internet as well as digital literacy and usage patterns. The third layer then focuses on how these digital inequalities serve as axes of inequality that further shape other domains, such as labor market chances, educational outcomes, and relationship prospects. In contrast, the fourth layer is of a more overarching nature, as it emphasizes how the broader contextual factors shape both the dimensions and axes of digital inequality.

These different levels can also be integrated into a multilevel model drawing on the classical structural-individualist approach of Coleman (1990), which can be applied to the digital divide, as depicted in *Figure 1-1*.

This multilevel model differentiates between access to digital infrastructure as material resources and digital skills and usage profiles as incorporated capital patterns. At the macro level, national or sub-national policies shape how institutions provide access to the digital world, promote digitalization, and diffuse digital skills. This, in turn, determines individual or microsocial access to the digital, as well as attitudes and skills at the micro level. Policies that are not sensitive to inequalities will widen the "digital divide" as already advantaged groups benefit more from these policies. Conversely, policies that tackle inequalities and compensate for lack of digital access and skills in certain groups can decrease individual disadvantages in these regards.

At the micro level, access and skills shape the usage of digital technologies, affecting both the frequency and patterns of usage. If digital access, skills, or attitudes differ between social groups, this can lead to divergent usage profiles across those groups. These digital usage profiles then have important consequences, as research has shown that digital usage can positively impact life chances such as educational attainment, labor market opportunities, and even health. Conversely, low digital usage or specific usage profiles may harm life opportunities in certain fields.

Importantly, there is feedback loop from the individual level to the meso level of institutions and back to the macro level of society. Increased individual digital use further supports the digitalization of institutions and society. The individual consequences of digital usage, such as raising educational levels, increasing political participation, or improving labor market chances, can then shape institutions related to these spheres and influence the macro level of society, for example by raising the overall societal educational level. Regarding inequalities, divergences in digital use, as well as the consequences of digital inequalities, can translate into the reproduction of inequalities at higher societal levels.

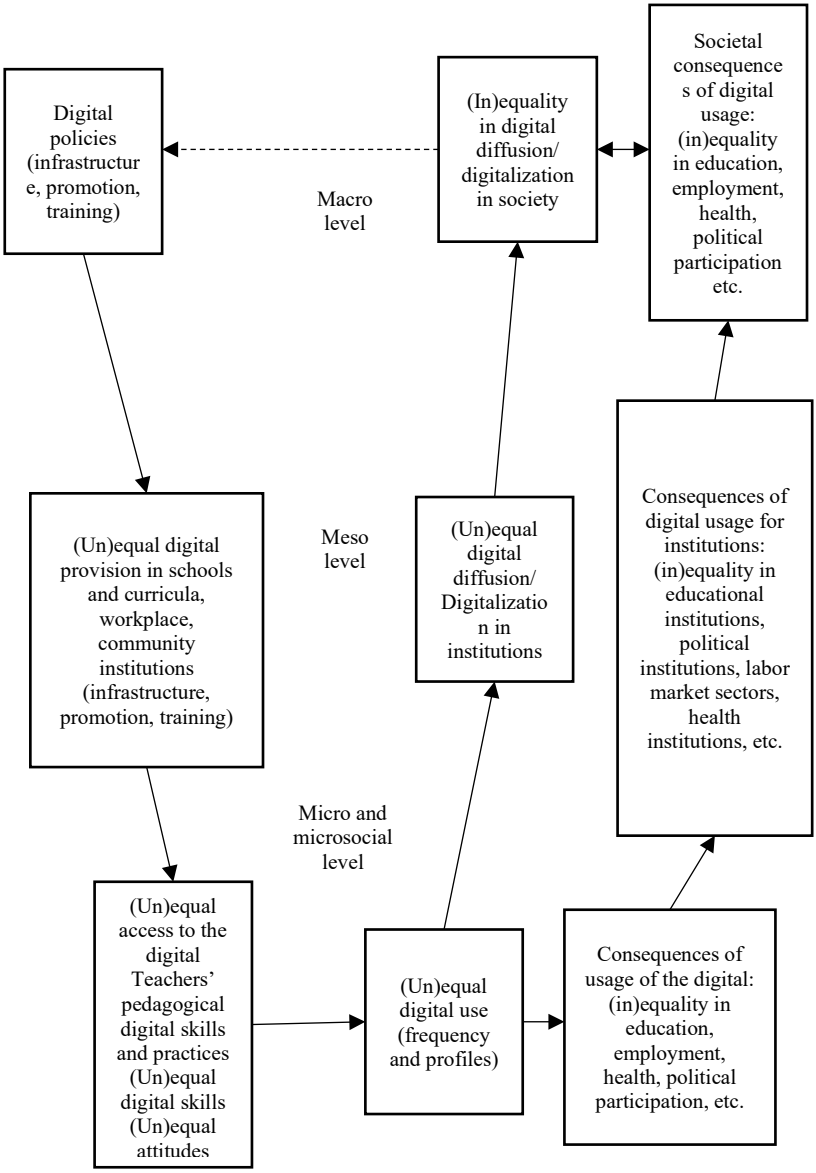

Fig. 1-1 Macro-meso-micro model of the digital divide, , diagram created by Andreas Hadjar (2024).

Digitalization as a process and the persistence of the digital divide

In the first section of the theoretical framework, we defined the digital divide and examined it from a multilevel perspective. Now, we turn our attention to the conception of digitalization as a dynamic process and explore whether this process has served to reduce or exacerbate digital inequalities.

Regarding the question of whether digitalization leads to more or fewer inequalities, Van Deursen and Van Dijk (2023) proposed two arguments. In the earlier stages of digitalization, before the 2000s, they argued that inequalities would not necessarily increase, as individuals could still rely on non-digital channels to successfully engage in activities such as consumption, production, political participation, and social interaction. Furthermore, they posited that as digitalization progressed, it would bring about universal internet access and the acquisition of internet knowledge and skills, thereby enabling previously disadvantaged groups to participate and become included.

However, Van Deursen and Van Dijk's review of the scholarly literature and research available in the 2000s led them to conclude that digitalization in fact increases inequalities. Drawing on the work of Witte and Mannon (2009), they argue that while the internet may facilitate a more open and free society, it can simultaneously reproduce existing social inequalities. Digital inequalities, being more relative than absolute in nature, relate to differential positions of inclusion and exclusion that are socially transmitted across generations, thereby making the internet a tool for maintaining social privileges.

The knowledge-gap hypothesis provides a theoretical foundation for understanding the persistence of the digital divide. The core argument of this hypothesis is "as the infusion of mass media information into a social system increases, segments of the population with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease" (Tichenor et al. 1970, 159). This leads to a widening of the knowledge gap between these groups, rather than a narrowing.

The digital divide is perpetuated by a self-reinforcing cycle of advantages and disadvantages. Applied to the digital divide, the knowledge-gap hypothesis suggests that digital skills are more easily internalized by individuals from higher socioeconomic status and higher educational backgrounds who are already advantaged in this regard. This is driven by