Working Paper on Digital Education
University of Cologne

Preliminary remarks

We live in a digital world. That is a fact. However, the impacts, risks and potential of digitalisation and its interconnections with human action, causal processes in nature and control by algorithms are often only understood by experts, while nowadays most of society is scarcely able to penetrate this complexity. Progressing digitalisation is thus removed from broad social discussion and at the same time influences ever larger areas of individual action, social structures and our democracy.

Furthermore, existing infrastructures for participating in and shaping the digital society are neither sufficiently modern nor implemented in line with the latest state of the art. Moreover, they are not forward-looking, and the corresponding knowledge and skills are pronounced among individuals and specific groups to a substantially greater or lesser degree. This also applies in sophisticated organisations such as universities, although they have shifted studies, teaching and learning – largely entirely and at very short notice – into the digital space remarkably smoothly during what was commonly called the "coronavirus semester". Despite this impressive performance, the upscaling of digital infrastructure or the swift development of what are referred to as "digital skills" (e.g. data literacy) among all university stakeholders remains a major challenge in the sense of the right to participation, equality of opportunity and education as well as forward-thinking (further) training. Mastering this challenge presupposes, among others, a science-led definition and conceptualisation of what digital skills are and how they can be integrated into a broader understanding of digital education. In addition, not only is the digitalisation of research methods and teaching/learning concepts advancing in a wide range of academic disciplines and research fields, but topics such as artificial intelligence and big data are also important research objects and incubators.

What does digital education mean at the University of Cologne?

As part of future skills – in the sense of "skills that will become far more important for professional life and/or social participation in the next [...] years" (Meyer-Guckel et al. 2018:14) – the University of Cologne defines digital education as an extension of traditional cultural techniques for all stakeholders, areas of university expertise, academic disciplines and service units with multiple dimensions (education, research, transfer, management and service), also in the sense of the European Skills Agenda (2020) and the European Digital Education Plan (2020).

Digital education cannot be reduced to "informatics education [as] the central catalyst for shaping the digital transformation in society and in the economy

successfully, inclusively and sustainably" (German Council of Science and Humanities 2020:55), which includes computer science-related skills such as digital literacy, computational thinking or data literacy, for the teaching of which the German Council of Science and Humanities ("*Wissenschaftsrat*") recommends a systematic export of teaching for students of other academic disciplines. Digital education also includes a "transformation in the sciences" towards, among others, a culture of sharing and of cooperation, appreciation of data and software work, a balance of high dynamics and stabilisation, and social exchange beyond standard science communication (cf. German Council of Science and Humanities 2020a:37ff.), new epistemic and ethical challenges and close cooperation between digital enablers – such as computer science – and other subjects (cf. German Research Foundation 2020:3f.).

Digital education is, in this sense, the science-led and research-based route for all stakeholders of the University of Cologne, the university community and society towards a subject-specific, transdisciplinary and interdisciplinary sovereignty in the digital world, towards a sound approach in dealing with highly dynamic human-environment-machine interactions, with big and small data as well as artificial intelligence.

Digital education is dynamic and forward-looking. It requires a new way of thinking, agility, boldness and co-creative processes. In this context, digital education as understood by the University of Cologne focuses equally on an image of humankind influenced by humanism, an academic habitus as well as stakeholders' ability to reflect critically and good scientific practice.

Preserving the UoC's values – democracy, pluralism, tolerance, openness, diversity and a declared commitment to an ethically and socially responsible and sustainable interaction between the individual, society and environment that fosters well-being – forms the foundation for the development of digital education at the UoC. Inter- and transdisciplinarity are just as much the basis for this holistic definition of digital education as is the commitment to the further development of the European idea now and in the future. This includes the continuous and future-oriented further development of the university as a top global university of the 21st century that is open to the world.

Our goal is to provide all stakeholders at the University of Cologne in their various roles with an excellent digital education from a subject-specific, transdisciplinary and interdisciplinary approach and to professionalise them. Our remit is to:

- Generate innovation and knowledge in the various academic disciplines, domains and inter- and transdisciplinary research fields as well as in research, teaching and transfer
- Educate and professionalise all stakeholders in an excellent and equitable manner
- Foster diversity and talent

- Create outstanding conditions for research as well as teaching and learning, along with the corresponding infrastructures

These tasks, together with our responsibility to make a contribution to solving the major societal challenges and to foster the well-being of each individual, society, the next generation and the planet, are guiding principles for us in the context of digital education too. We regard the University of Cologne as a digital leader within the City of Cologne as well as at regional, national and international level.

Perspectives on digital education

Digital education is viewed from at least six perspectives:

a) **Teaching and learning** – Digital education refers to both the outcome of an educational process as well as to the educational process itself. It necessitates suitable teaching-learning settings and the related digital tools, resources and data, distinct from and complementary to purely analogue forms of learning, working and communicating, a consideration of the social and cultural prerequisites of these tools, resources and data and reflection on their importance in the teaching-learning process. Digital academic teaching understood in this way includes digital media (content) as well as fundamental algorithmic and methodological principles and is evaluated from a formative and summative perspective in terms of its added value in comparison to traditional, analogue approaches.

b) **Research and transfer** – The critically reflected use and analysis of the potential of digitalisation, big and small data, artificial intelligence, their mechanisms, impacts and potential etc. are conducive to the generation of knowledge and innovation in academic disciplines, research domains and interdisciplinary research fields as well as in research, teaching, transfer, management and internationalisation in general as well as to digital innovation itself – and must now come to full bloom. This takes place on the basis of trustworthy science and the assumption of responsibility for the individual, the social community, the environment and for mastering the major societal challenges. The digital education process also takes place in a subject-specific and cross-disciplinary as well as an interdisciplinary and transdisciplinary manner *within* research, teaching and transfer.

c) **Training, upscaling, empowerment** – Digitalisation must be *put into practice*. It is a matter of our taking responsibility for the further training of all stakeholders, the goal being their digital sovereignty, future prospects and *empowerment* both in academic disciplines as well as all areas of university expertise. We must prepare the next generation of stakeholders *now* for the

challenges of the future. Digital education is conducive to a type of continuous and dynamic (subject-specific) academic/professional training that is responsive to change, the objective being an effective, efficient, individually satisfying as well as critical and reflective handling of digital tools, resources and data in various roles and functions as well as contexts.

d) **Digital autonomy** – Digital education fosters temporally and culturally embedded skills and aspects of knowledge so that social participation and individual personal development are facilitated through the teaching of skills in orientation, reflection and action needed in a digital society and world. These also focus especially on questioning digitalisation as a process and an outcome in various contexts with regard to its social consequences on an individual as well as a structural level.

e) **Individuality and diversity** – Digital education takes into account the different learning backgrounds, professional requirements and generation-specific (prior) experiences of the various stakeholders and considers both an outcome-oriented perspective in the sense of skills development as well as the process character of individual media appropriation, together with the subjective and structural prerequisites and framework conditions that influence skills acquisition. This plays a role both with regard to the stakeholders at the UoC as well as regarding their respective target groups in practice.

f) **Shaping the university as a modern learning world** – Digital education relies on a scalable and integrated digital infrastructure that brings together resources, tools and data to form a powerful digital ecosystem. Beyond this, it demands a strategic redesign of teaching and learning spaces and, not least, adjusted organisational structures as elements of a modern and future-proof "university learning world" (cf. Stang/Becker 2020).

The university is the right place to put digital education in this sense into practice:

- Thanks to the diversity of innovative minds, the possibility for collaboration between generations and stakeholders in different roles, the university has the potential to permanently (further) develop digital education from a science-led and research-based approach and to put it into practice in a forward-looking way.

- Despite populism, fake news and the increasing dissemination of conspiracy theories, trust in science has grown. It is important that we continue to build on this with all the strength we have, by facing the major societal challenges with and for society and the next generation.

- The pandemic has made digitalisation even more experienceable, exposed hazards and disadvantages in all dimensions of our existence, but also, however, documented potential and opportunities as well as outstanding leadership, collective action and the will to change.
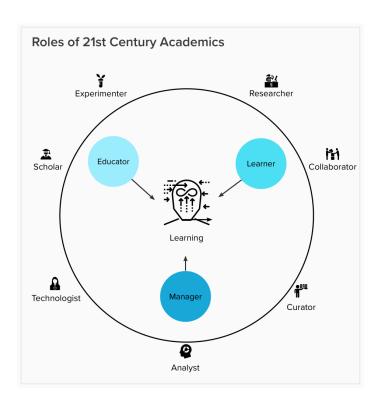
Stakeholders' roles in a digital university

A multi-perspective approach to digital education makes it possible to define more precisely the different, partly altered, but often parallel roles of the stakeholders at a university engaged in addressing the digital transformation. In this context, we are inspired by "Anatomy of 21st Century Educators" by Simon Bates (2014) and his talk at the UoC in March 2020.

Academics, students and support staff in administration and projects are

a) Technologists
b) Curators
c) Collaborators
d) Experimenters
e) Analysts

while academics and students additionally form a community of researchers and teachers/learners.

Despite the *common* roles, the different composition and significance of *individual* roles result in complex and clearly distinguishable profiles. The task now will be to establish exactly what knowledge and skills are needed for these individual roles and on what scale they can be taught to all groups of stakeholders via a joint approach.

Roles of 21st Century Academics

Components of digital education

Digital education as an individual outcome of an educational process comprises five components:

- **Data literacy** as the ability to collect, manage, evaluate and apply data in a critical way (cf. Ridsdale et al. 2015)

- **Digital literacy** understood as competent handling of digital tools, paradigms and technologies (e.g. coding, AI, blockchain)

- **Digital responsibility** as the conscientious and value-based critical reflection on the prerequisites and impacts of one's own digital activities

- **Digital teaching and learning** understood as the ability of the teacher and the learner to activate educational processes through didactically expedient virtual and hybrid formats, processes and structures according to competence levels and from a research-based approach

- **New work methods and practices** understood as the ability to appropriate and apply new work approaches, such as design thinking or co-creation

Each of these components must be conceptualised and operationalised. Especially for students, to what extent relevant skills are acquired in the context of their particular syllabus, in an interdisciplinary component of a degree programme (Studium Integrale) or in the framework of extracurricular activities offered by the university needs to be clarified.

Digitale Bildung @ UzK – fachlich / überfachlich

Data Literacy		Digital Literacy		Digital Responsability		Digital Learning & Teaching		New Work	
Data Management	Data Evaluation	Algorithmic Thinking	Artificial Intelligence	Critical Media Literacy	Netiquette & Code of Conduct	Innovative Educational Concepts	Interactive and Inclusive Teaching and Learning Environments	Agile	Design Thinking
Data Application	...	Information & Communications Technology ICT-Literacy	...	Green Transition	...	Innovative Forms of Assessment	...	Remote Work	...

graphic designed with mural: https://www.mural.co/

Paper produced as cooperation of:

<u>Core group</u>
Professor André Bresges, Professor Beatrix Busse (Vice-Rector for Teaching and Studies), Jan Eden, Franziska Eickhoff, Dr Alexandra Habicher, Dr Patrick Honecker, Professor Kai Kaspar, Ingo Kleiber, Dr Daniel Kramp, Dr Udo Kullik, Mark Kusserow, Professor Nadia Kutscher, Professor Axel Klawonn, Dr Björn Schmitz-Luhn, Dr Magdalena Spaude, Dr Hendrik den Ouden

<u>Participants of the *Digital Education* arena:</u>

Dr Hans-Jörg Bauer, Dorothee Baumann, Professor Klaus Peter Berger, Judith Berns, Professor Patrick Bettinger, Sebastian Beyl, Professor Matthias Bickenbach, Irmgard Blomenkemper, Dr Stephanie Bölts, Daniela Boosen, Himanshi Braun, Professor André Bresges, Professor Beatrix Busse (Vice-Rector for Teaching and Studies), Dr Celestine Caruso, Matthias Delahaye, Dr Hendrik den Ouden, Antonia Deus, Gesa Diekmann, Dr Jens Dierkes, Dr Nadia Dimassi, Sabine Domhan, Jan Eden, Franziska Eickhoff, Professor Oyvind Eide, Lars Emmerichs, Yasmin Emre, Alice Oeter, Dr Daria Ferencik-Lehmkuhl, Sven Fischer, PD Dr Roger Fornoff (Lecturer), Dr Sabrina Förster, Christian Friebe, Ina Gabriel, Dr Christoph Gantefort, Florian Genz, Markus Gerhards, Miriam Gertzen, Carina Goffart, Diana Gowalow, Ayla Güler Saied, Jonas Günther, Dr Alexandra Habicher, Dr Tobias Hasenberg, Frank Hasenstab, PD Dr Dominik Hezel (Lecturer), Junior Professor Sandra Hofhues, Dr Judith Hofmann, Dr Patrick Honecker, Professor Kai Hugger, Dr Ilham Huynh, Jan Tiegel, Dr Yassin Karay, Professor Kai Kaspar, Dr Pamela Kilian, Moritz Kinder, Christine Kirsch, Professor Axel Klawonn, Ingo Kleiber, Andrea Klein, Marc Kley, Dr Matthias Knopp, Paul Koch, Dr Sabine Koch, Kathrin Kölle, Dr Udo Kullik, Hanna Küpper, Susanne Kurz, Mark Kusserow, Professor Nadia Kutscher, Ruth Lang, Professor Ulrich Lang, Dr Martin Lanser, Dr Guido Lauen, Curie Lee, Alisa Looks, Anja Löwe, Professor André Marchand, Professor Rudolf Mathar, Verena Meis, Professor Torsten Meyer, Professor Andreas Michel, Junior Professor Peter Moormann, Simone Mostert, Linda Müller, Dr Johannes Müller, Dr Hubertus Neuhausen, Wibke Niels, Kenji Nishino, Dr Tilmann Ochs, Professor Eleftheria Paliou, Anne-Kathrin Pietsch, Dr Torsten Preuß, Lars Fabian Prinz, Dr Daniel Rauprich, Tobias Rebholz, Birger Reiss, Dr Nils Reiter, Julian Rettberg, Dr Annette Ricke, Dr Dirk Rohr, Dr Steffen Roth, Stefanie Ruetz, Dr Christoph Scheicher, Junior Professor Julian Scheu, Professor Daniela Schmeinck, Dr Björn Schmitz-Luhn, Professor Detlef Schoder, Maik Schössow, Junior Professor Konstanze Schütze, Professor Inge Schwank, Professor Christian Schwens, Dr Seiwerth Stephan, Sarah Smikale, Nadimo Staszak, Eike Steinke, Dr Julia Suckut, Professor Holger Thünemann, Beate Vossel-Newman, Professor Birgit Weber, Dr Andreas Weber, Isabelle Wessel, Andreas Witthaus, Joss Wobser, Dr Judith Zepp, Junior Professor Carina Zindel

Literature

Bates, Simon (2014). Anatomy of 21st Century Educators (Talk)

Deutsche Forschungsgemeinschaft (2020). Digitaler Wandel in den Wissenschaften.

European Commission (2020). European Skills Agenda

European Commission (2020a). European Digital Education Action Plan

Krommer, A. et al. (2019). Routenplaner Digitale Bildung

Meyer-Guckel, V., Klier, J., Kirchherr, J. & Winde, M. (2018). Future Skills: Strategische Potenziale für Hochschulen (Stifterverband Diskussionspapier Future Skills 3)

Wissenschaftsrat (2020). Perspektiven der Informatik in Deutschland

Wissenschaftsrat (2020a). Zum Wandel in den Wissenschaften durch datenintensive Forschung

Ridsdale, C. et al. (2015). Strategies and Best Practices for Data Literacy Education Knowledge Synthesis Report

Stang, R., Becker, A. (2020). Zukunft Lernwelt Hochschule