

Knowledge Diversity at Universities? A critical analysis of changing post-digital knowledge ecologies using examples from Austria, Germany, and Italy

Barbara Gross

Faculty of Education, Free University of Bozen-Bolzano

Barbara.Gross@unibz.it <https://orcid.org/0000-0002-3072-8081>

Theo Hug

Department of Media, Society and Communication, University of Innsbruck

Theo.Hug@uibk.ac.at <https://orcid.org/0000-0003-1279-623X>

Ulrike Stadler-Altmann

Faculty of Humanities, Social Sciences and Education, Humboldt University of Berlin

Ulrike.Stadler-Altmann@hu-berlin.de <https://orcid.org/0000-0002-3583-8562>

Abstract

In the last decade, debates on digitalization programs and on dynamics of datafication have become increasingly influential at universities. More recently, debates on the importance of so called “Artificial Intelligence” (AI) have begun, although corresponding questions about changing knowledge ecologies are currently underexplored in educational research. The processes of changing knowledge production are encountering relatively entrenched structures of knowledge organization and communication at universities, which are struggling to handle these new challenges. In this paper we analyze the historically-shaped university organization structures in three European countries. Thus, first we give an overview of the concepts of knowledge ecology and knowledge diversity, followed by, second, a critical discussion of current trends in the digitalization and datafication of scientific knowledge production in education with examples from

Italy, Austria and Germany. The choice of these different and highly complex scientific systems is justified by our experiences in these diverse contexts and corresponding academic affiliations. Third, we reflect on the implications of changing knowledge ecologies and knowledge diversity for the future of higher education.

Keywords: knowledge diversity, knowledge ecologies, educational science, digital capitalism, future of higher education

Technology, Knowledge, and Education

Throughout history, technological changes have influenced educational concepts and practices, as well as visions for the future of education, and are still doing so today. This applies to all areas of education and not least to higher education¹. Particularly over the past three decades, not only have information and communication technologies, but also the associated rhetoric gained increasing influence (Haugsbakk & Nordkvelle, 2007; Zulaica y Mugica & Zehbe, 2022). Alongside both technology-enthusiastic and -pessimistic tendencies that have accompanied all major media transformations, a range of ambivalences and more subtly defined feelings of (dis)comfort have emerged within educational cultures of digitality. These ambivalences are particularly tied to unresolved questions about the distribution of responsibility in co-evolutionary human-machine constellations and the secondary importance given to public good and sustainability in education-related metrics. Moreover, the use of misleading metaphors in the discourse about educational algorithms as well as AI and robotics in education often contribute confusion and insecurity rather than enlightenment and sustainable orientation (Hug, 2021).

During the COVID-19 pandemic, the level of digitalization in higher education institutions and schools came under critical scrutiny, revealing limitations, especially regarding the competences of educational personnel (Huber & Helm, 2020; Morselli et al., 2021). In Austria, Germany, and Italy, as in other countries, efforts to promote the development of a robust digital education ecosystem have been intensified. On the one hand, these efforts can be viewed within the context of a long history of imagining the future of education (Jukes & Schaaf, 2019). On the other hand, claims about the future of education highlight aspects of innovation and technological disruption (BMBWF, 2020; BMBF, 2019; MIUR, 2020) without critically reflecting on pedagogical questions, such as the history of "teaching machines" (Watters, 2023). Scholars have attempted to reimagine the future of higher education. Peters et al. (2020), for example, offer an informed outlook on emerging digital, online, and pedagogical possibilities as well as the core goals of education. Although their contributions focus on diverse aspects – from digitalization to ethics, uncertainty, and transdisciplinarity – and provide varied answers to the question of new pedagogical possibilities for universities, they find a common thread in the estimation that rethinking and changing higher education brings an increased potential to support students in becoming engaged learners and critical citizens. They and others (e.g., Böhmer, Schwab & Isso, 2024) highlight the opportunities for lifelong learning in various contexts through the hybridization of formal and informal digital contexts. Furthermore, Peters and Romero (2019) for example, found that online higher education students shape their learning ecologies through unique configurations of activities, digital resources, and networked social support, highlighting the need for academic programs and teachers to empower these ecologies across contexts. Although Peters et al. (2020) emphasize the crucial role of universities in developing democratic and equitable societies, there are still neoliberal tendencies and a globally unbounded digital capitalism to be challenged (Staab, 2022; Peters, 2012; Means, 2018).

¹ In this paper, we specifically examine universities within the field of higher education, as they represent key institutional sites for knowledge production and dissemination. Our results are relevant for higher education in general; however, they need to be specified for different fields and types of institutions and organizations.

If discussions of the (relative) autonomy of universities are not to illustrate a euphemism and if the aforementioned role is to carry more than rhetorical weight, there is a need for critical awareness of shifts in knowledge ecologies and a reflection on the transformation of knowledge cultures within digital academic environments. As for the history of the concept of knowledge ecology, its applications and systematic efforts of clarification in this field, numerous publications have been issued (e.g., Shrivastava, 1998; Wojciechowski, 2001; Kuhlen, 2013; Pór & Molloy, 2000; North, 2021; Peters et al., 2021; Peters et al., 2022; Vodă et al. 2023). According to North (2021), knowledge in a knowledge ecology is viewed as a process that fosters self-directed, emotional-rational learning, embraces change, and manages complexity through self-regulation. A knowledge ecology thus seeks to create favorable conditions for the flourishing of “knowledge plants”.

At this point, we will refrain from a comprehensive analysis of knowledge ecological concepts as distinct from informational, communicational, and media-ecological perspectives. This article aims at advancing debates on knowledge ecology through the concept of knowledge diversity, exemplifying problematic aspects of evolving knowledge ecologies concerning the potential for internationalization and epistemic diversity within educational science in Austria, Germany, and Italy. The article illustrates how recent developments may not only enhance but also limit the potential for internationalization and diversity in higher education, contrary to stated intentions.

Knowledge Diversity and Knowledge Ecology in the Context of Digitization and Digitality

Despite the multiplicity of current diversity discourses in educational sciences, certain desiderata remain evident. This includes questions of differentiation of different knowledge – that is, diversity knowledge – and heterogeneous knowledge forms – i.e., knowledge diversity (Rammert, 2016; Beinstainer et al., 2024; Gross, 2024). There is limited cross-national reception of educational research publications (Gross et al., 2022; Karlics et al., 2024), alongside a Western-dominated perspective on the production, reception, and dissemination of knowledge (Spivak, 1988/2010). This recalls familiar critiques of Eurocentric perspectives in educational contexts (see Basu et al., 1999; Knobloch, 2014) and raises questions about the epistemological significance of diversity and the interplay between epistemic and epistemological diversity (Robertson, 2013; Gobbo & Russo, 2020; Horsthemke, 2020). Furthermore, the datafication, digitization, normalization, commodification and commercialization of scientific knowledge processes within digital capitalism have only begun to be explored (see Means, 2018; Williamson, 2021; Dander et al., 2024), and their implications for diminishing knowledge diversity merit closer examination. The same applies to post-digital perspectives on knowledge ecology (see e.g., Peters et al., 2021; Peters et al., 2022; Green, 2023).

Like knowledge ecology (Kuhlen, 2013, p. 68), the term *knowledge diversity* is relatively infrequently and ambiguously employed. Both concepts allow for varying interpretations and possess descriptive and normative uses. While terms such as media ecology and communication ecology have been in use for decades, “knowledge ecology” is a more recent concept (Shrivastava, 1998; Pór & Molloy, 2000). Kuhlen (2013), drawing on Hess and Ostrom (2007) and engaging with knowledge economy issues, develops a commons-oriented perspective focusing on “a reasonable, individual, social and cultural development as well as political participation and ensuring economic well-being and sustainable use of the resources knowledge and information” (Kuhlen, 2013, p. 68).

However, like other approaches to information and knowledge ecology, Kuhlen's conceptualizations also require updating in the light of post-digital media constellations, expansion of digital capitalism, machine learning advancements, and considerations of knowledge diversity.

Significant insights into knowledge diversity come from the sociology of technology. Rammert (2016), noting tendencies toward the rationalization, collection, and standardization of knowledge, advocates for knowledge diversity and an intelligent knowledge policy that fosters "differences within and between various expert cultures" and complements a "policy of quantitative knowledge growth" with a "qualitative policy of knowledge diversity" (Rammert, 2016, p. 286). Contrary to "solutionism" orientations (Morozov, 2013), this understanding recognizes different expert cultures and the interactive, aspect-rich nature of knowledge. This understanding of knowledge diversity aligns with Agre's (2000) notion of "deep diversity". While the economies of scaling and the homogenizing effects of IT networking may enable only "shallow diversity," "deep diversity" can arise from "independent evolution in unrelated and completely incommensurable institutional, cultural, and technical contexts" (Agre, 2000, p. 75).

In analyses on knowledge ecologies, it is crucial to acknowledge both different knowledges (diversity knowledge) and various forms of knowledge (knowledge diversity). Funk (2024) addresses this in relation to AI ethics, distinguishing between intersubjective, non-explicit forms of "knowing how" (as opposed to propositional "knowing that") that are often undervalued in digital information processing but are essential for moral action and societal resilience. Kaeser (2019) similarly conceptualizes knowledge ecology as a balance between "know-how," "know-why," "know-what," and "know-where" forms of knowledge.

While the use of ecological metaphors in knowledge contexts has both illuminating and obscuring effects, ecological perspectives offer multifaceted options for describing, analyzing, shaping, and critiquing knowledge forms, content, and dynamics. These considerations span both the normative dimensions of environmental sustainability and the descriptive aspects of knowledge organization, diversity, and distribution.

The term "ecology," like "diversity," is often narrowly used and primarily associated with environmental awareness. Only recently has the concept of knowledge ecology been discussed in educational science, exploring the complex interplay of knowledge generation, dissemination, and reception, and human action through various media, technologies, and communication channels, as highlighted at the joint annual conference of the Society for Media Studies (GfM, 2021) and the Department of Media, Society, and Communication at the University of Innsbruck.

Assuming that knowledge and information cannot solely serve short-term purposes of economic capitalism, this contribution engages with concepts of sustainable knowledge and information practices beyond economic motivations, mere consumption, and commercialization (Kuhlen, 2013). There is widespread agreement that new, publicly accessible communication and information offerings, particularly AI, will bring unprecedented changes to knowledge ecology, presenting significant opportunities and challenges for daily life and individual educational trajectories: digital and scientific literacy are deemed future key competencies, extending beyond the organizational context of universities.

Current Digital Practices in Universities

Educational practices at universities aim to build sustainable knowledge that is applied in both research and teaching and is continuously expanded. The way education is discussed in higher education reflects how education is conceptualized, understood, and conveyed. There is a noticeable fragmentation of skills and competences required (e.g., OECD 2021; WEF 2021; Ehlers 2020) in general and specifically with regard to digital and/or online skills.

This is evident in the analysis of the macro-, meso-, and micro-perspectives of academic knowledge ecologies, particularly when discussing the role of digitization, the future of education at universities, and the global education industry. A central question is which knowledge remains relevant in higher education, how to handle different knowledge forms, and how to ensure the trustworthiness of knowledge in a post-factual age. The question on which type of knowledge remains relevant is interwoven with the growing call to decolonize higher education curricula by incorporating diverse epistemologies, particularly those from the Global South. This approach aims to counteract the dominance of Western epistemologies and promote inter-epistemic dialogue (R'boul, 2022).

Universities are expected to outline new educational horizons for the future. However, they are subject to international, national and local education policies and governance, which hamper internationalization and digitalization attempts. Researchers (see e.g., the bibliographic study conducted by González-Sanmamed et al., 2020) agree that higher education is undergoing a transformation due to technological development, requiring individuals to take more control over their own learning process and adopt lifelong learning. Against this background, this article will examine, comparing educational sciences at universities in Austria, Germany, and Italy, how evolving (digital) knowledge ecologies influence the internationalization and epistemic diversity of higher education, and what are the potential opportunities and contradictions inherent in these developments.

Aspects of University Knowledge Ecologies

Processes aimed at increasing efficiency, accountability, and datafication have led to scientists today being constantly evaluated by third parties. Despite significant differences among European countries there is a similar trend towards knowledge capitalism in Europe and beyond. University administrations and ministries now use metrics, benchmarks, and data to measure, in particular, the quantity of research outcomes. This measurement affects the planning and development of academic careers and, consequently, the generation, dissemination, and reception of knowledge, as well as university knowledge and educational ecology. However, acceptance of this measurement system and data management in academic institutions is not universal, as recent research shows (Schiefner-Rohs et al., 2023). The fact that some countries have recently seen counter-movements² and initiatives for reforming scientific evaluation indicates that new ways are being sought and sometimes already being taken to improve the quality and impact of research.

² An example of such initiatives is the project running in the Netherlands until 2026, which emphasizes the quality of scientific achievements over the quantity of results (Dutch Research Council, 2024). This program is aligned with the

Despite these counter-movements, output- and quantity-oriented evaluation processes still prevail, with publications in journals and the acquisition of external funding playing a crucial role in these processes. Publications by researchers in journals listed in internationally recognized literature databases (e.g., Web of Science and Scopus) undergo a rigorous quality assurance system and a peer-review process. These journals adhere to scientific standards, which are also upheld by the researchers themselves. At the same time, they contribute to the commercialization of knowledge and academic competition, as these listed journals are predominantly published by commercial publishers. Consequently, researchers' publications become part of Big Data, with scientific publishers managing entire utilization chains (e.g., providing literature databases, ranking databases, disseminating literature and metadata in digital systems, and conducting statistical analysis) to generate economic profit (Rummler, 2020). Scientific publishing has thus become an "industrial cultural production," independent of the intrinsically valuable process of mutual quality control among scientists as peers who are interested in substantive discourse and scientific knowledge production (Bechky & Davis, 2025). The fundamental difference between this publication strategy and cultural industry lies in the fact that capital does not accrue to universities as employers but to publishers and corporations (Rummler, 2020).

Such processes are not only driven by international corporations and publishers but are also significantly influenced by underlying university governance and organization. Therefore, to illustrate and critically discuss these processes and differences in various countries, Table 1 compares Austria, Germany, and Italy, focusing on the organizational structure of universities and national knowledge production, dissemination, and evaluation practices in educational science. Inspired by the model for dealing with knowledge in institutions and companies according to North (2021), we used its structuring into *Knowledge Repository*, *Alternation Model* and *Knowledge Ecology*, and transferred it to the university system. In Table 1, *Knowledge Repository* corresponds to *Organization of universities and Evaluation of research*, as knowledge is made available and evaluated here in the sense of referentiality. The structure *Alternation Model*, understood as knowledge transfer, is assigned to the rows *Dominant HE teaching methods*, *National qualification for university teaching and research*, *Internationalization* and *Digitalization strategies*. These structures have a significant influence on *Knowledge Ecology*, labelled as 'Trustworthy' knowledge in the table. The international comparison highlights the fact that framework conditions of knowledge production lead to comparable patterns in the utilization, creation and dissemination of knowledge.

Table 1:*Selected Aspects of Knowledge Ecologies in Educational Sciences in Comparison*

	Austria	Germany	Italy
Organization of Universities	Centralized and partly autonomous (BMBWF 2021; OECD/EU 2019)	Specific autonomy within federal states (HRK, 2021)	Centralized and semi-autonomous (Berning, 2002; Donina et al., 2015)
Dominant HE teaching methods	Presentations with phases of discursive knowledge transfer in lectures; cooperative development of research knowledge in seminars (Uni Hamburg, 2020)		Lecture format with discursive elements (Uni Hamburg, 2020)
Evaluation of research	Autonomy and self-regulation; Peer review of central importance		Standardized research evaluation at national level (L 240/2010; ANVUR, 2024)
“Trustworthy” knowledge	Peer-reviewed scientific articles and monographs; journals recognized by the scientific discipline; specialist journals in databases are gaining in importance		Monographs, published by recognized publishers; scientific articles, in nationally ranked “class A” journals
National qualification for university teaching and research (de: <i>Habilitation</i> , it: <i>abilitazione scientifica nazionale</i>)	Decentralized evaluation with university-dependent criteria and discrete interests and negotiation processes; one national scientific qualification		Central and standardized evaluation by expert commissions appointed at national level; two ³ national academic qualifications
Internationalization	Attempts at internationalization are primarily reflected in <i>anglicization</i> : increased use of English in publication behavior (Karlics et al., 2024)		
Digitalization strategies in the past 5 years	Bottom up and top down; efforts and results depend on the university and the particular federal state		Top down; university dependent decisions and strategies

The overview highlights the expected close interconnection between the university structure and the scientific organization of the respective state. If the education system is more centralized, as in Italy, universities are also subject to a more centralized regulation. If the state is federally organized, as in Germany, specific federal characteristics are evident. This difference is illustrated through selected examples such as research evaluation and national qualification processes. The comparison reveals not only differences in the organization of universities but also in common

³ One per qualification level for 1) Associate Professor and for 2) Full Professor.

teaching formats and in the classification of reliable educational science knowledge. In a largely centralized higher education system where research evaluation is standardized, knowledge production adheres to national criteria for “trustworthy” knowledge, thus imposing limits on the knowledge ecology.

At first glance, the uniform internationalization observed in the selected countries might appear surprising. Here, the orientation toward the lingua franca dictates the strategy and comparability. This leads to an imbalance in the knowledge ecology at universities because knowledge produced, discussed, and influential outside these linguistic contexts rarely gains attention in international academic collaborations. This creates tendencies of marginalization not only for the national language-based knowledge ecology but even more for linguistic diversity in European and international scientific discourse.

Additional differences relate to the organization of science. In Italy, for example, research and teaching are organized according to scientific disciplinary sectors, which also determine, *inter alia*, the designation of professorships. Fundamental differences also exist in how knowledge is communicated and conveyed through language, as shown by Heller (2006) and Heller et al. (2015) for Italy and Germany. These frameworks are now subject to changes driven by new technological possibilities (Stadler-Altman 2022).

Due to the digitization processes described above, it is now much easier to establish comparability or a semblance of comparability. Only knowledge products that conform to the structure of a technical tool (e.g., input forms, predefined selection options, and limited character count) are counted and evaluated. Although all publications are listed, their presentation is subjected to a standardization that maintains the illusion of easy comparability – comparability necessitates complexity and, thus, criteria to ensure comparability and scientific assessability.

Regarding internationalization strategies in educational sciences in Germany, Austria, and Italy a tendency toward anglicization is shown, emphasizing English in publications (Karlics et al., 2024). Digitalization strategies differ across these contexts. In Germany and Austria, digitalization follows both top-down and bottom-up approaches, with progress varying by university. The higher education system in Italy, by contrast, employs a predominantly top-down model, with national policies shaping digital strategies, yet implementation remains contingent on regional and organizational contexts. These contrasts reveal diverse pathways to modernization in higher education, influenced by governance structures and local conditions, affecting the scope and impact of both internationalization and digitalization.

The practices of university knowledge assessment and the associated steering of the sciences have, with the possibilities of digitization, entered a process of standardization and apparent homogeneity that must be critically analyzed within science itself. In order to stimulate this discussion, the following propositions are formulated.

Knowledge Diversity and Changing Knowledge Ecologies in Higher Education - Some Pointed Statements for Further Discussion

Regarding the impact of changing knowledge ecologies and questions of knowledge diversity in the higher education sector, the following theses can be proposed.

Producing Educational Research:

- National governance and educational research evaluation practices, as well as differences among (European) countries, limit the potential of internationalization efforts.
- The limited linguistic diversity in academic publishing restricts the potential of knowledge and epistemic diversity (Gobbo and Russo, 2020).

Across Europe, it can be observed that the knowledge products of researchers in different countries are evaluated differently. Analyzing, from this perspective, the national list of A-journals within the disciplinary sectors of educational science in Italy, one finds that 18% of the listed journals are based in Italy (Gross et al., 2023). These journals receive limited attention in European and international contexts, partly due to their linguistic focus and also because of the expectation that researchers contribute to the development of the national academic field. This is reinforced by national selection and evaluation strategies that favor scholars from the local context. Similar trends are observable in Austria and Germany, where journals considered relevant during qualification phases are guided by either faculty regulations or agreements among academics. However, these agreements can be discussed, challenged, and adjusted by relevant committees based on specific needs, potentially fostering greater autonomy within universities. Nevertheless, linguistic barriers remain, as national languages or the lingua franca are often preferred, and knowledge products in other languages are seldom acknowledged.

Arenas-Castro et al. (2023) highlight the lack of linguistic sensitivity in scientific knowledge ecology through an analysis of publication support for A-journals in the natural sciences: "Scientific knowledge is produced in multiple languages but is predominantly published in English. This academic publishing practice creates a language barrier to the generation and transfer of scientific knowledge between communities with diverse linguistic backgrounds, hindering the ability of scholars and communities to address global challenges and achieve diversity and equity in science, technology, engineering, and mathematics" (Arenas-Castro et al., 2023: p. 1). A similar analysis in educational science journals reveals comparable results. While educational science publications differ from those in STEM fields, research by Karlics et al. (2024) shows that articles on "Intercultural Education" listed in international databases are predominantly published in English. However, the dominant publication practice in educational science remains oriented towards national languages. Thus, while the influence of English is increasing in educational science publication practices, national relevance persists and is often implicitly assumed.

National languages and the lingua franca remain crucial for scientific exchange. Future considerations must address how to handle AI-assisted translations of scientific texts. While communication may become easier, the challenge is to maintain high-quality scientific writing. Are traditional peer review processes sufficient, or are additional competencies needed?

Effects of Digitization and Datafication:

- The increasing importance of research data management (OPEN Data, FAIR Data) presents ambivalent tendencies in relation to diversification and openness (e.g., collective use of research data) vs. standardization and closure (e.g., regulated processes).
- Data-driven trends in research, evaluation, and educational governance clash with the need for diverse forms of knowledge to solve complex problems.
- The emergence of new professions (e.g., "Data Steward," "Data Security Engineer," "Educational Analyst," "Privacy Officer," "Educational Robotics Specialist") is more driven by technological developments and administrative requirements than by educational needs.
- The decline in knowledge diversity within changing pedagogical knowledge ecologies represents a blind spot in educational research and practice in higher education.

The trend of viewing research data not as personal property but as resources for wider use poses challenges, such as making data technically accessible. This can lead to standardization, potentially excluding researchers who lack the necessary programs or reliable internet access. There is also the risk of outsourcing data management to providers who may have the technical resources but lack subject-specific knowledge, such as structuring data appropriately. Additionally, there is limited discussion in research data repositories about authorship, rights, and methodological diversity, which are crucial for transparent knowledge generation and fostering an ecology that values diverse knowledge equally. Ideas for a "Knowledge Commons 2.0" could offer various solutions and new publication formats, but concerns from funding bodies, such as the "Heidelberg Appeal" of March 22, 2009, and issues around intellectual property rights, remain unresolved.

Educational science research that addresses these propositions should focus on elements of a balanced knowledge ecology. Kaeser (2019) describes knowledge ecology as a balance between knowledge types: know-how, know-why, know-what, and know-where. This perspective adds depth to the discussion on knowledge diversity, raising questions about what kind of knowledge is being negotiated when shaping the future of education. Currently, there is an emphasis on "know-where," especially regarding search engines and platformization, which prioritize immediate information retrieval over theoretical exploration and practical application. This trend affects knowledge generation and dissemination at universities. Research findings not accessible online or through search engines are often overlooked, pressuring researchers to adapt to these formats. While this enhances knowledge exchange, it overlooks the fact that digitalization and datafication do not equate to knowledge production. Kaeser (2019) identifies this as a fundamental epistemological misunderstanding: equating knowledge with information. Information can be objectified, outsourced, stored, managed, and processed by a machine. Knowledge needs a subject to internalize the information. Knowledge is a personal growth process, and this process is called education.

Shaping the future of education requires focusing on the people behind technological processes and fostering diverse approaches to information-handling and knowledge-building at universities. This implies increased attention to developing regional and individual knowledge ecologies as educational processes and incorporating these perspectives into educational research.

Conclusions and Future Prospects

In the context of commercial digital educational media, there is no shortage of "Ed-Tech" promises that highlight the advantages of digitalization, automation, datafication, and AI for researchers, educators, learners, and educational organizations as a whole. Teaching and learning in the digital space seem to be easier, with new learning opportunities and knowledge just a click away. It is often neglected that learning requires effort, that educational and cognitive processes require open spaces and structures and that the use of learning technologies does not replace individual engagement with the content. The vast possibilities for information retrieval on the internet initially lead to data collections, but these do not necessarily result in the generation of new knowledge or differentiated processes of knowledge-building. The above comparison of the handling of knowledge and knowledge transfer in universities in three European countries shows that, despite all the differences in teaching and research, technology-based teaching leads to a change in the sense of technical standardization. The technical and digital framework conditions appear to be more powerful than curricular requirements (Morselli et al., 2021).

A related issue is the increasing platformization, data-driven and algorithm-driven technologies and the education-industrial complex (Picciano and Spring, 2013) pose the risk of diminishing knowledge diversity and increasing path dependence in decisions related to educational research and policy. This would limit reflection on questions of knowledge diversity and its significance for globally relevant solutions to the pressing educational issues of our time, as only what is offered through technical solutions would be seen and used. Instead of tailored digital solutions for educational automation and the production of prescribed competencies, a meta-reflective approach to changing knowledge ecologies is required. This can only succeed if the knowledge ecologies at universities are not made so dependent on search engines and platforms that automated evaluations and opaque recommendation systems become decisive in assessing the quality of knowledge production.

References

- Agre, P.E. (2000). The Market Logic of Information. *Knowledge, Technology, & Policy*, 13(3), 67-77.
<https://doi.org/10.1007/s12130-000-1021-y>
- ANVUR (2024). *Riferimenti normativi*. <https://www.anvur.it/anvur/riferimenti-normativi/>
- Arenas-Castro, H., Berdejo-Espinola, V., Chowdhury, S., Rodríguez-Contreras, A., James, A. R. M., Raja, N. B., Dunne, E. M., Bertolino, S., Emidio, N. B., Derez, C. M., Drobniak, S. M., Fulton, G. R., Henao-Díaz, L. F., Kaur, A., Kim, C. J. S., Lagisz, M., Medina, I., Mikula, P., Narayan, V. P., . . . Amano, T. (2024). Academic publishing requires linguistically inclusive policies. *Proceedings Of The Royal Society B Biological Sciences*, 291(2018).
<https://doi.org/10.1098/rspb.2023.2840>
- Basu, S., Höhme-Serke, E., & Macher, M. (Eds.) (1999). *Eurozentrismus: Was gut ist, setzt sich durch? Beiträge zur Kritik einer die Welt beherrschenden Denk- und Handlungsweise. Studienreformprojekt Eurozentrismus in der Lehre*. IKO.
- Bechky, B. A., & Davis, G. F. (2025). Resisting the Algorithmic Management of Science: Craft and Community After Generative AI. *Administrative Science Quarterly*, 70(1), 1-22.
<https://doi.org/10.1177/00018392241304403>
- Beinstein, A., Dittrich, A.-K., & Hug, T. (Eds.) (2024). *Wissensdiversität und formatierte Bildungsräume*. Innsbruck: iup. <https://doi.org/10.15203/99106-129-8>
- Berning, E. (2002). *Hochschulen und Studium in Italien*. Bayerisches Staatsinstitut für Hochschulforschung und Hochschulplanung. Deutscher Akademischer Austauschdienst (2020, 27. März). Italien: Bildung und Wissenschaft.
<https://www.daad.de/de/laenderinformationen/europa/italien/ueberblick-bildung-und-wissenschaft/>
- BMBF (2019). *Verwaltungsvereinbarung DigitalPakt Schule 2019 bis 2024*.
https://www.bmbf.de/SharedDocs/Downloads/files/vv_digitalpaktschule_web.pdf?__blob=publicationFile&v=2
- BMBWF (2020). *Digitale und soziale Transformation. Ausgewählte Digitalisierungsvorhaben an öffentlichen Universitäten 2020 bis 2024*.
https://pubshop.bmbwf.gv.at/index.php?rex_media_type=pubshop_download&rex_media_file=digital_uni.pdf
- BMBWF (2021). *Perspectives on national strategies to promote learning and teaching*.
<https://oead.at/index.php?elD=dumpFile&t=f&f=27622&token=ec4c8c8de77a393938d991d11b989e05fa6ed485>

- Bock, A., Breiter, A., Hartong, S., Jarke, J., Jornitz, S., Lange, A., & Macgilchrist, F. (Eds.) (2023). *Die datafizierte Schule*. Springer Fachmedien Wiesbaden. <https://doi.org/10.1007/978-3-658-38651-1>
- Böhmer, A., Schwab, G., & Isso, I. (Eds) (2024). *Digitale teaching and Learning in higher education. Culture, language, social issues*. transcript. <https://doi.org/10.1515/9783839462768>
- Dander, V., Grünberger, N., & Niesyto, H. (Eds.) (2024). *Bildung und digitaler Kapitalismus*. Kopaed.
- Donina, D., Meoli, M., & Pleari, S. (2015). Higher Education Reform in Italy. *Higher Education Policy*, 28, 215-234. <https://doi.org/10.1057/hep.2014.6>
- Dorfsman, M., & Horenczyk, G. (2022). The Coping of Academic Staff with an Extreme Situation: The Transition from Conventional Teaching to Online Teaching. *Education and Information Technologies*, 27(1), 267-289. <https://doi.org/10.1007/s10639-021-10675-0>
- Dutch Research Council (2024). *Recognition and Rewards*. <https://www.nwo.nl/en/recognition-and-rewards>.
- Funk, M. (2024). Nichtwissen ist Macht! Künstliche Intelligenz und ihre diversen Ethiken. In A. Beinsteiner, A.-K. Dittrich & T. Hug (Eds.), *Wissensdiversität und formatierte Bildungsräume* (41-58). iup. <https://doi.org/10.15203/99106-129-8-04>
- GfM (2021). *Jahrestagung der Gesellschaft für Medienwissenschaft 2021*. <https://www.uibk.ac.at/congress/gfm/index.html.de>
- Gobbo, F., & Russo, F. (2020). Epistemic Diversity and the Question of Lingua Franca in Science and Philosophy. *Foundations of Science*, 25(1), 185-207. <https://doi.org/10.1007/s10699-019-09631-6>
- González-Sanmamed, M., Sangrà, A., Souto-Seijo, A., & Blanco, I. (2020). Learning ecologies in the digital era: challenges for higher education., 50, 83-102. <https://doi.org/10.30827/PUBLICACIONES.V50I1.15671>
- Gottburgsen, A., Hofmann, Y. E. & Willige J. (2023). Digitale Lernumwelten, studentische Diversität und Learning Outcomes. Empirische Befunde und Implikationen für die digitale Hochschulbildung. In T. Schmohl, A. Watanabe & K. Schelling (Hrsg), *Künstliche Intelligenz in der Hochschulbildung. Chancen und Grenzen des KI-gestützten Lernens und Lehrens, Hochschulbildung: Lehre und Forschung* (p. 119–144). transcript. <https://doi.org/10.25656/01:27834>
- Green, B. (2023). Postdigital Knowledge Ecologies. In: Jandrić, P. (eds), *Encyclopedia of Postdigital Science and Education* (pp.1-5). Springer. https://doi.org/10.1007/978-3-031-35469-4_5-1
- Gross, B. (2024). Diversifizierung von (Wissens-)Diversität in der Erziehungswissenschaft? Wissensproduktion am Beispiel des Diversitätskonzepts – eine bibliometrische Analyse. In A.

- Beinstein, A.-K. Dittrich, & T. Hug (Eds.), *Wissensdiversität und formatierte Bildungsräume* (S. 143-155). Innsbruck university press. <https://doi.org/10.15203/99106-129-8-11>
- Gross, B., Karlics, K., & Hofbauer, S. (2023). Standardisierungen und Diversifizierungen in (inter)nationalen erziehungswissenschaftlichen Publikationskulturen. In S. Hofbauer, F. Schreiber & K. Vogel (Eds.), *Grenzziehungen und Grenzbeziehungen des Disziplinären. Verhältnisbestimmungen (in) der Erziehungswissenschaft* (pp. 82–91). Verlag Julius Klinkhardt. <https://doi.org/10.35468/6042-08>
- Haugsbakk, G., & Nordkvelle, Y. (2007). The Rhetoric of ICT and the New Language of Learning. A Critical Analysis of the Use of ICT in the Curricular Field. *European Educational Research Journal*, 6(1), 1-12. <https://doi.org/10.2304/eerj.2007.6.1.1>
- Heller, D. (2006). L'autore traccia un quadro...Beobachtungen zur Versprachlichung wissenschaftlichen Handelns im Deutschen und Italienischen. In K. Ehlich & D. Heller (Eds.), *Die Wissenschaft und ihre Sprachen* (pp. 63-86). Peter Lang.
- Heller, D., Hornung, A., & Carobbio, G. (2015). Mündlichkeit und Schriftlichkeit in italienischer Hochschulkommunikation. *Deutsche Sprache*, 4, 293-308. <https://doi.org/10.37307/j.1868-775X.2015.04.03>
- Hess, C., & Ostrom, E. (Eds.) (2007). *Understanding Knowledge as a Commons: From Theory to Practice*. The MIT Press. <https://doi.org/10.7551/mitpress/6980.001.0001>
- Hochschulrektorenkonferenz (HRK) (2021). *Statistische Daten zu Studienangeboten an Hochschulen in Deutschland Studiengänge, Studierende, Absolventinnen und Absolventen. Wintersemester 2021/2022. Statistiken zur Hochschulpolitik 1/2021*. Berlin.
- Horsthemke, K. (2020). 'Epistemologische Vielfalt' – Bildungstheoretische Überlegungen. *Philosophische Bildung und Didaktik. Ethik und Bildung*, 83-101. J.B. Metzler. https://doi.org/10.1007/978-3-476-05171-4_6
- Huber, S.G., & Helm, C. (2020). COVID-19 and Schooling: Evaluation, Assessment and Accountability in Times of Crises – Reacting Quickly to Explore Key Issues for Policy, Practice and Research with the School Barometer. *Educational Assessment, Evaluation and Accountability*, 32(2), 237-270. <https://doi.org/10.1007/s11092-020-09322-y>
- Hug, T. (2021). Thesen zum (Un)Behagen in Bildungskulturen der Digitalität. In H. Hierdeis (Ed.), *Digitalisierung und Gemeinwohl*, 149-171. Asanger.
- Hofmann, J. (2009). Zukunft der digitalen Bibliothek. *APuZ*, 08.03.2009, 25-32. <https://www.bpb.de/shop/zeitschriften/apuz/31691/zukunft-der-digitalen-bibliothek/>
- Jukes, I., & Schaaf, R. L. (2019). *A Brief History of the Future of Education: Learning in the Age of Disruption*. Corwin.

- Kaeser, E. (2019). *Wir brauchen eine neue Wissensökologie*. Keynote Bürgerstock-Konferenz 11./12. Januar 2019. [www.buergerstock-konferenz.ch/images/2019/BK19_Presentation Eduard Kaeser DE.pdf](http://www.buergerstock-konferenz.ch/images/2019/BK19_Presentation_Eduard_Kaeser_DE.pdf)
- Karlics, K., Hofbauer, S., Gross, B., & Keiner, E. (2024). Erziehungswissenschaftliche Kommunikationskulturen im Vergleich: Deutschland – Italien in bibliometrischer Perspektive. *Bildung und Erziehung*, 57-78.
- Knobloch, P. D. Th. (2014). Reflektierter Euro- und Okzidentozentrismus. Über die Verortung von Bildung und Erziehungswissenschaft im Kontext globaler Pluralität. In S. Rühle, A. Müller, P. Knobloch & T. Dylan (Eds.), *Mehrsprachigkeit - Diversität - Internationalität. Erziehungswissenschaft im transnationalen Bildungsraum* (pp. 297-320). Waxmann.
- Kuhlen, R. (2013). Wissensökologie. In R. Kuhlen, W. Semar & D. Strauch (Eds.), *Wissen und Information als Commons (Gemeingüter)* (pp. 68-85). DeGruyter. <https://doi.org/10.1515/9783110258264.68>
- MIUR (2020). *Digitale, 29 milioni per le smart class nelle scuole del secondo ciclo*. <https://www.miur.gov.it/-/digitale-29-milioni-per-le-smart-class-nelle-scuole-del-secondo-ciclo-br-pubblicato-l-avviso-pon-br-azzolina-prosegue-investimento-per-innovazione->
- Means, A. (2018). *Learning to Save the Future. Rethinking Education and Work in an Era of Digital Capitalism*. Routledge. <https://doi.org/10.4324/9781315450209>
- Morozov, E. (2013). *To Save Everything, Click Here. Technology, Solutionism and the Urge to Fix Problems that Don't Exist*. Public Affairs.
- Morselli, D., Dell'Anna, S., Bellacicco, R. & Stadler-Altmann, U. (2021), Online Teaching amid the Covid-19 Pandemic: Insights from faculty members. A study in the context of teacher training at a university. In U. Stadler-Altmann (Eds.), *Digitale Lehrerbildung. Themenheft LbP Lehrerbildung auf dem Prüfstand* (pp. 103-119). Verlag emp. Pädagogik.
- North, K. (2021). *Wissensorientierte Unternehmensführung: Wissensmanagement im digitalen Wandel*. 7. Auflage. Springer Gabler.
- OECD (2019). *Supporting Entrepreneurship and Innovation in Higher Education in Austria, OECD Skills Studies*. OECD Publishing. <https://doi.org/10.1787/1c45127b-en>
- OECD (2021). *Future of Education and Skills 2030. Organisation for Economic Co-operation and Development*. <https://www.oecd.org/education/2030-project/>
- Peters, M. (2012). Postmodern Educational Capitalism, Global Information Systems and New Media Networks. *Policy Futures in Education* (10)1, 23-29. <https://doi.org/10.2304/pfie.2012.10.1.23>
- Peters, M. A., Rizvi, F., McCulloch, G., Gibbs, P., Gorur, R., Hong, M. & Hwang, Y., . . . (2022). Reimagining the New Pedagogical Possibilities for Universities Post-Covid-19: An EPAT

Collective Project. *Educational Philosophy and Theory*, (54)6: 717-760.

<https://doi.org/10.1080/00131857.2020.1777655>

Peters, M. A., Jandrić, P. & Hayes, S. (2021). Biodigital Philosophy, Technological Convergence, and Postdigital Knowledge Ecologies. *Postdigital Science and Education*, 3(2), 370-388.

<https://doi.org/10.1007/s42438-020-00211-7>

Peters, M. A., Jandrić, P., & Hayes, S. (2022). *Bioinformational philosophy and postdigital knowledge ecologies*. Springer. <https://doi.org/10.1007/978-3-030-95006-4>

Picciano, A. G., & Spring, J. H. (2013). *The great American education-industrial complex. Ideology, technology, and profit*. Routledge.

Peters, M., & Romero, M. (2019). Lifelong learning ecologies in online higher education: Students' engagement in the continuum between formal and informal learning. *Br. J. Educ. Technol.*, 50, 1729-1743. <https://doi.org/10.1111/BJET.12803>

Pór, G., & Molloy, J. (2000). Nurturing systemic wisdom through knowledge ecology. *The Systems Thinker*, 11(8), 1-5.

Rammert, W. (2003/2016). Zwei Paradoxien einer innovationsorientierten Wissenspolitik: Die Verknüpfung heterogenen und die Verwertung impliziten Wissens. In W. Rammert (Ed.), *Technik – Handeln – Wissen* (pp. 257-286). Springer VS. https://doi.org/10.1007/978-3-658-11773-3_13.

R'boul, H. (2022). Intercultural philosophy and internationalisation of higher education: epistemologies of the South, geopolitics of knowledge and epistemological polylogue. *Journal of Further and Higher Education*, 46, 1149-1160. <https://doi.org/10.1080/0309877X.2022.2055451>

Robertson, E. (2013). The epistemic value of diversity. *Journal of Philosophy of Education*, 47(2), 299-310. <https://doi.org/10.1111/1467-9752.12026>

Rummler, K. (2020). Die Dialektik des Publizierens in der akademischen Kulturindustrie im Zeitalter der Digitalisierung. In V. Dander, P. Bettinger, E. Ferraro, C. Leineweber & K. Rummler (Eds.), *Digitalisierung – Subjekt – Bildung* (pp. 251-272). Verlag Barbara Budrich. <https://doi.org/10.2307/j.ctvnb7n3h.16>

Schiefner-Rohs, M., Hofhues, S., & Breiter, A. (Eds.) (2023). *Datafizierung (in) der Bildung: Kritische Perspektiven auf digitale Vermessung in pädagogischen Kontexten*. Digitale Gesellschaft, Band 59. transcript. <https://doi.org/10.14361/9783839465820>

Schmohl, T., Watanabe, A., & Schelling, K. (Eds.) (2023). *Künstliche Intelligenz in der Hochschulbildung. Chancen und Grenzen KI-gestützten Lernens und Lehrens*. Hochschulbildung – Lehre und Forschung, Band 4. transcript. <https://doi.org/10.14361/9783839457696-001>

- Shanks, R. (2020). 30 years of ICT in education: reflecting on educational technology projects. In *seminar.net*, 16(2), 15. <https://doi.org/10.7577/seminar.4047>
- Shrivastava, P. (1998). Knowledge Ecology: Knowledge Ecosystems for Business Education and Training. Online-document, <https://web.archive.org/web/20170825081451/http://www.facstaff.bucknell.edu/shrivast/KnowledgeEcology.html>
- Spivak, G. C. (1988/2010). *Can the subaltern speak? Reflections on the History of an Idea* (ed. by R. Morris). Columbia University Press.
- Staab, P. (2022). *Digitaler Kapitalismus. Markt und Herrschaft in der Ökonomie der Unknappheit*. (3rd ed.). Suhrkamp.
- Stadler-Altman, U. (2022). Präsenz- oder Online-Lehre, oder besser hybride Lehre? Change-Prozesse in der Lehre einer italienischen Universität. In *NHHL, Neues Handbuch Hochschullehre*. D 3.45. <https://www.nhhl-bibliothek.de/de/handbuch>
- Stalder, F. (2018). *The Digital Condition*. Polity Press.
- Universität Hamburg (2020). *Linguistische Profilierung einer europäischen Wissenschaftsbildung (eurowiss): euroWiss-Ergebnisse*. <https://www.slm.uni-hamburg.de/forschung/forschungsprojekte/eurowiss.html>
- Vodă, A. I., Bortos, S., & Şoitu, D. T. (2023). Knowledge Ecosystem: A Sustainable Theoretical Approach. *European Journal of Sustainable Development*, 12(2), 47-66. <https://doi.org/10.14207/ejsd.2023.v12n2p47>
- Watters, A. (2023). *Teaching Machines: The History of Personalized Learning*. MIT Press.
- WEF (2021). *Skills for Your Future*. World Economic Forum. <https://www.weforum.org/focus/skills-for-your-future>
- Williamson, B. (2021). Making Markets through Digital Platforms: Pearson, Edu-Business, and the (e)Valuation of Higher Education. *Critical Studies in Education*, 62(1), 50-66, <https://doi.org/10.1080/17508487.2020.1737556>
- Williamson, B. & Hogan, A. (2020). *Commercialisation and privatisation in/of education in the context of Covid-19*. Brussels: Education International. https://issuu.com/educationinternational/docs/2020_eiresearch_gr_commercialisation_privatisation?fr=sZDJkYjE1ODA2MTQ
- Wojciechowski, J. A. (2001). *Ecology of knowledge*. Council for Research in Values and Philosophy.
- Zulaica y Mugica, M. & Zehbe, K.-C. (2022). *Rhetoriken des Digitalen: Adressierungen an die Pädagogik*. Springer Vieweg. <https://doi.org/10.1007/978-3-658-29045-0>