metaphors she uses. In his target article, Krippendorff (§42) shows how constructions can have a pathological influence when used to enforce or try to enforce objectivity-without-parenthesis as is presented in "widely accepted philosophy of science" (§44). Critically examining observers' language about the "realities" that emerge in second-order cybernetics is a welcome move supporting the use of RC in the social domain.

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Enhancing Future Perspectives through Critical Analysis of Misleading Metaphors in Educational Contexts

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> Abstract • I deal with the role of misleading metaphors in educational innovation by means of selected examples. My aim is to highlight the relevance of Krippendorff's critical metaphor analysis for enabling diverse paths of educational innovation and the enhancement of scopes for action.

Handling Editor • Alexander Riegler

« 1 » Klaus Krippendorff's article summarizes important conceptual aspects of his intellectual work and his "scholarly life in cybernetics" (Krippendorff 2019). In further development of his understanding of a radically social constructivism (Krippendorff 2008) towards critical cybernetics, he discusses historical precursors, epistemological problems, the role of metaphors and not least the relevance of emancipatory strategies. In my estimation, metaphors and their analysis can, without exaggeration, be considered among the areas that have interested him throughout his life, starting from his early work (Krippendorff 1993, 1994) to the target article discussed here. Two strands of his interdisciplinary research interests came together for me. His much-cited article on metaphors of communication (Krippendorff 1994) was my first point of contact with his work.[1] A decade later, his design-theoretical considerations (Krippendorff 2006) turned out to be relevant for educational design and research, too. Accordingly, I want to underline the interdisciplinary significance of his work with some remarks on the role of

1| Another reason for my focus on metaphors lies in vivid memories of his inspiring presentation "Theories of Metaphor and Their Metaphors" at the session "Beyond Metaphors," which I chaired at the 59th annual conference of the International Communication Association in Chicago, USA, 21–25 May 2009.

misleading metaphors in educational innovation and the need for critical perspectives.

« 2 » To my knowledge, Krippendorff never published systematic analyses dealing with questions of pedagogy, education and educational research. In §§24f, 48 of his target article, Krippendorff mentions some educational topics together with other societal topics, but they do not appear as the subject of systematically differentiating analyses. Still, from a metatheoretical perspective, his work remains inspiring and relevant for educational research, too, not least because of his methodological contributions and his basic theoretical considerations at the crossroads of foundational and applications research, qualitative and quantitative approaches, and blurring disciplinary boundaries. For example, the terms "education" and "design" have been used in very various ways by different actors and in multiple contexts. Krippendorff's (2016) arguments concerning design as an "undisciplinable profession"[2] and the limited relevance of scientific research aiming at evidence for predictive theories can be applied to education, too (Müller, Bohne & Thole 2013; Glaser & Keiner 2014). The same counts for Krippendorff's (2016) arguments regarding possibilities of innovation, ethical constraints, claims for professionalism and high standards of quality as well as improvement of designing processes. Both groups, designers and educators, are facing similar challenges regarding societal expectations towards predictable results, cost-effective interventions, the facilitation of technological innovation as well as socio-cultural and economic developments and, not least, dealing with big data (Williamson 2017; Schimpf & Goldstein 2022). As far as educational and design research are concerned, expectations that relate to a focus on measurable dimensions of data practices and material culture, quantitative empirical methodologies and the acceptance of key performance indicator management in higher education institutions (Hugentobler et al. 2010; Schiefner-Rohs, Hofhues & Breiter 2023) have become increasingly important.

« 3 » In his target article, Krippendorff argues that "understanding social forms of organizations with mathematical, computational, and especially biological metaphors results in at least three *systemic pathologies* with considerable oppressive implications for those who embrace them in their discourse" (§17). These pathologies concern the superior role of the conceptualizers (§18), the discursive mobility of problematic metaphors as well as their common and nonreflective use in public narratives (§§19f), and blinding out human constituents and their relevance for social and organizational change (§21). Using two examples of metaphors, I would like to show how his considerations can be connected to other approaches to metaphor analysis in educational research generally (Guski 2007; Wegner & Nückles 2016) and to educational technology and education in contexts of digitalization in particular (Hug 2019). Let us take *robot teacher.* Talking of social humanoid robots as "teachers" aims at educational innovation in terms of complementing or (partly) substituting teachers' tasks and responsibilities, at least relieving them from monotonous routines, boring duties, and workload stress. The metaphor suggests intelligent support for teachers and learners in order to open up spaces for meaningful and inspiring pedagogical activities. It ignores the complexity of professional teaching activities, questionable issues of educational economics and labor politics. Furthermore, it conceals the pedagogical relevance of forms of tacit knowledge and not least the educational dimensions of situation-related intelligence, prudence and mindfulness that are relevant to practical action and that have been discussed for centuries with reference to the Ancient Greek expression *phronesis.* Another example is *School 4.0* – Echoing practices of versioning in programming, this metaphor suggests an "update" of educational systems in analogy to the Fourth Industrial Revolution ("Industry 4.0"). However, conceptualizing education in analogy to industrial production and logistics does not pay attention to self-determined actions and the long-held professional status of educators. Taking education as an element of a programmed interplay of machines, devices, sensors and humans, or as a kind of cyber-physical system to be engineered and to be monitored and controlled by a computational core, obscures pedagogical issues of creativity, openness and unavailability (*Unverfügbarkeit*).

« 4 » There are many more examples that could be listed here, such as flipped classroom, smart education, digital natives, digital education, chatbots as coaches, learning bots, or robots as companions as discussed in Hug (2019) and Weller (2022). We are not just dealing with a few problematic metaphors here. Rather, we are facing a complex web of many misleading metaphors that are connecting academic, political and economic discourses about education and educational innovation. In doing so, the three pathologies can be linked to all examples mentioned here. This means that in all cases we can find assumptions of

- the superior role of the conceptualizers of social organizations in the name of future-oriented education,
- the use of problematic metaphors across different discursive contexts, as well as
- their self-evident use in public narratives.

Moreover, such metaphors do not only play a role in the context of "Ed-Tech Speak" (Selwyn 2016) and the global education industry's efforts to frame educational processes and to brand learning tools. They also serve as mediators at the interfaces of public narratives, pedagogical practices, education research, education policy and economics of education. It can be easily overlooked that the casual or self-evident use of such metaphors does not do justice to the complexity of educational processes. Even though machines and especially robots can perform complex tasks, this does not mean that the techno-optimistic promises are redeemable

2| With this catchy and trenchant title, Krippendorff is not aiming at a yes-or-no answer but rather towards clarifications of what it means to be a discipline. Moreover, an "important reason for not giving a yes-or-no answer […] is that questions of what we call design, what we expect designers to do, how we educate people to become designers, and for what should designers be respected by their clients and society at large, are wide open" (Krippendorff 2016: 197). The argument of openness also plays an important role in other respects: "Designers ought to be free to think and act outside disciplinary boxes, not just by being able to work in multidisciplinary teams, but also in defiance of the determinisms that scientific disciplines seek to import in the social domain and of special interests that seek to direct the design process to their limited ends" (ibid.: 200).

or desirable in any case or that the machines can replace human expertise and pedagogical qualification.

« 5 » It is typical of the aforementioned metaphors that they illuminate aspects such as

- innovative advancements in educational technology,
- possibilities of fruitful human-machine interactions for educational purposes,
- efficient employment of forward-looking technologies,
- dealing with trustworthy and helpful assistants,
- reducing workloads for administrators and releasing teachers from routine tasks,
- making use of new options for the promotion of computational thinking and
- taking account of the requirements of international competitiveness.

These aspects typically elicit positive connotations, both in contexts of nonreflective use in public narratives and especially among administrators and decision-makers. At the same time, the metaphors mentioned are obscuring other aspects such as

- commercial interests of education industries,
- limitations of the computability and predictability of complex educational phenomena,
- the creation of new dependencies, as well as
- disinterest in democracy and emancipatory education, critical media literacy, educational justice, political empowerment and issues of sustainable development.

Moreover, in order to understand conceptual and performative dimensions of metaphors in "digital education" as enablers, facilitators, nebulizers, eye-openers, motivators, drivers, tranquilizers, or bridge builders, aspects of digital materiality should be considered, too, in order to better understand "material metaphors" (Hayles 2002) and "transcoding metaphors" (van den Boomen 2014) and their translational functions between cultural and digital codes.

« 6 » Since the metaphors mentioned above have action-guiding functions in various contexts and since they are effective in political decision-making, too, we as citizens and researchers should not be indifferent to their misleading character. This is not only due to academic interest in a differentiated use of language, clarification and enlightenment. This is also due to the accountability challenge (Mansell 2018) and because questions of attributing responsibility cannot be adequately answered within the framework of instrumental approaches and technological promises of education. This is in line with Krippendorff's argument for "extending cybernetics to become a different kind of discourse, capable of addressing, if not correcting any painful social pathologies it could cause" (§22). There are many paths of educational innovation, and not only the paths suggested by the global education industries. The emancipatory strategies that Krippendorff (§§33f) highlights and his approach to metaphor analysis open up possibilities for a differentiated understanding of narratives about media and technology in cultures of digitality. In so doing, his work offers important points of reference such as the three systemic pathologies for revealing epistemological characteristics of the use of metaphors and for enhancing scopes of educational design and pedagogical action.

« 7 » Krippendorff considers "*agency* fundamental to being human" (§26) and presents critical cybernetics as a "discourse aimed at liberating humans from the painful constraints of their agency" (§58). This opens up fruitful perspectives at the crossroads of critical cybernetics and critical understandings of pedagogy and education as *Bildungswissenschaft* (Benner & English 2004). This is significant particularly in view of historical and current discourses about cybernetics in educational research. At least in German-speaking countries, critical discussions in educational research about cybernetics refer to uncritical cybernetics *sensu* Krippendorff (§1) no matter whether they refer to the approaches to programmed instruction of the 1960s and 1970s (Schmidt 1973) or to recent developments of educational technology and practical school training in the wake of behaviorism and cybernetics (Hof 2018). Krippendorff's take on critical cybernetics prompts an alternative to the understanding of educational technology as an application of social engineering. It points to the manifold possibilities of educational design between wide openness and "automated education" as an endeavor to transfer teaching and learning processes into schematic, generalizable and automatable structures. It is not least Krippendorff's emphasis on the special role of human agency that becomes significant at the crossroads of education and AI, too. Accordingly, a modified version of Heinz von Foerster's (2003) ethical imperative of "always increase the number of choices" could be as follows: Act always so as to reduce the chances of humans serving artificial stupidity and to increase the probability of artificial intelligence functioning in the service of human intelligence and ethically informed decisions.

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Critiquing Critical Cybernetics

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> Abstract • In the spirit of Krippendorff's proposal for a critical cybernetics, I explore the possibility of a critique of some of the consequences of the proposal for cybernetic practice and its subsequent impact on the everyday lives of humans around the globe.

Handling Editor • Alexander Riegler

« 1 » In the target article, Klaus Krippendorff has proposed a sweeping revision of the cybernetic experiment begun in the 1940s with the Josiah Macy, Jr. meetings on "Circular Causal and Feedback Mechanisms in Biological and Social Systems." Calling the revision critical cybernetics, he argues that for cybernetic thinking to continue to be relevant it must heed Margaret Mead's (1968) admonition that cyberneticians apply this way of thinking to themselves and take responsibility for the consequences of their ideas, theories and language in our societies and the everyday lives of people everywhere (§1). I explore in this commentary the relation between critical cybernetics and my description of cybernetics as "a way of thinking about ways of thinking of which it – cybernetics – is one" (Richards 2020: 20). I start with some personal background with Krippendorff, which I consider relevant to my reflections. I then discuss some differences about the concept and role of individual "thinking" that emerged in conversations I had with Krippendorff. Although I describe our differences as minor, I conclude with some observations about their consequences for practicing cyberneticians as they consider how to place the contributions of the legendary names in the field.

Background

« 2 » Krippendorff was my first teacher and mentor in cybernetics. I had taken a required course, as an undergraduate electrical engineering student, called Elements of Communication. The textbook for the course was Ross Ashby's (1956) *An Introduction to Cybernetics*. It was my favorite course, with my favorite instructor and textbook.