The Propagation of Inter- and Transdisciplinary Virtues

Sjang ten Hagen[1] and Annemarie Horn[1]

1. Liberal Arts and Sciences, Faculty of Humanities, Utrecht University, the Netherlands

Abstract - Do the production of disciplinary knowledge, on the one hand, and inter- and transdisciplinary knowledge, on the other, require different sets of attitudes, mindsets, or personal qualities? In this article, we begin to answer this question by focusing on several foundational texts on inter- and transdisciplinary (ITD) studies published between the 1970s and the early 2000s. We found that virtues such as reflexivity, responsibility, and creativity were prominent in both early and in more recent ITD literature. Although additional virtues – including open-mindedness, flexibility and teamwork – came into focus later, the virtues that were considered important seem surprisingly stable over time. However, the basis for these claims has changed between the periods studied. Over time, the texts became less prescriptive and argumentative, and became more descriptive, relying on literature reviews and empirical studies to support claims about required and desirable qualities of ITD scholars. This shift in the way ITD and its virtues are being talked about is consistent with studies of ITD entering a stage of mainstreaming and consolidation as a distinct research field. We argue that this also puts the field at risk of developing blind spots for collective assumptions. We thereore take our findings as a call for the continued critical examination of ITD virtues, both from within and outside the field of ITD studies. Finally, as a step forward we suggest in-depth ethnographic studies to gain insights into ITD practices grounded in theory and philosophical argumentation, and move beyond self-report based research that may feed reproduction.

Keywords: Interdisciplinarity, transdisciplinarity, virtues, attitudes, competencies, philosophy of interdisciplinarity

1. Introduction

Do inter- and transdisciplinarity (ITD) require a particular set of attitudes, mindsets, or personal qualities? It would seem so, judging by the way interdisciplinary study programs present themselves today. For example, the Institute for Interdisciplinary Studies (IIS) at the University of Amsterdam states in its educational vision that its mission is for students in its study programs to develop certain "attitudes" for inter- and transdisciplinary research. For example, they want them to "develop the courage to work as trailblazers in uncertain and unknown situations." They also want them to be capable of "reflecting critically in their analysis and on themselves."[1] Similarly, Harvard University's interdisciplinary Liberal Arts and Sciences program presents itself as an "academic exploration across disciplines" that trains its students to "think critically [and] reason analytically" for them to lead "meaningful lives, with conscientious global citizenship, to enhance the greater good."[2] Moreover, one of the many interdisciplinary bachelor programs in Philosophy, Politics, and Economics (PPE), at the private university of Witten/Herdecke in Germany, presents PPE as "THE degree programme for creative minds."[3]

This article examines how and why this talk about qualities, attitudes, and mindsets such as self-reflexivity, criticality, and creativity has become prominent in the discourse of inter- and transdisciplinary research and education. In what contexts has the importance of these virtues been established? And how, if at all, do inter- and transdisciplinary virtues differ from disciplinary ones? The present article is based on a close reading and historical contextualization of a series of foundational texts on inter- and transdisciplinarity[4] since the 1970s that discussed

---

[1] https://iis.uva.nl/en/about-the-iis/educational-vision/educational-vision.html (accessed on 20 June 2024). We are both alumni of the IIS.
[2] https://college.harvard.edu/academics/liberal-arts-sciences (accessed on 20 June 2024).
[3] https://www.uni-wh.de/en/uwh-international/university/degree-programmes-requiring-german-language-skills/ppe-philosophy-politics-and-economics-ba/ (accessed on 20 June 2024).
[4] As we set out to understand how the discourse about inter- and transdisciplinarity and related virtues developed over time, we focused on authors and texts that explicitly use the terminology "interdisciplinary" and "transdisciplinary". We take both terms together as their discourses are closely interwoven and the combination of both terms captures the meaning of primary interest to us: the discourse that emerged from a call for science that is sensitive to real-world complexity.

precisely these questions.[5] In analyzing these sources, we asked what specific virtues authors considered crucial to inter- and transdisciplinarity. Our method is similar to what scholar of inter- and transdisciplinarity Julie Thompson Klein has called "discourse analysis," that is, "a rhetorical analysis of the language and argument of transdisciplinarity, with emphasis on historiographical and sociological analysis of the boundary work of defining TD" (Klein, 2014, p. 69).

We also drew on the philosophical framework of virtue epistemology to clarify which personal qualities, mindsets, character traits, orientations, and attitudes, or indeed *virtues*, have been emphasized within the discourse on inter- and transdisciplinarity, and for what reasons. We understand virtues here as an umbrella term for personal qualities, mindsets, and attitudes that are considered desirable within a community; within scholarly communities of researchers, virtues thus function as social and cognitive norms. Put another way, *scholarly virtues* (also called intellectual virtues or epistemic virtues) are those kinds of personal qualities that are understood within a community to be essential for the production of good knowledge or to being a good scholar, such as objectivity, rigor, creativity, honesty, humility, open-mindedness, or integrity (Hajek et al., 2024). Our historical reconstruction of the discourse about such virtues, which aspires to contribute to a broader "historical virtue epistemology" (Paul 2017; see also Kidd 2021 on "historical vice epistemology"), highlights the persistent prominence of such notions in the discourse on inter- and transdisciplinarity.

Others have already applied the framework of virtue epistemology in order to clarify the scope and meaning of inter- and transdisciplinarity. For example, in their introduction to a recent special issue on "the intellectual character of interdisciplinary researchers," Claudia Vanney and José Sáenz argue that "intellectual curiosity, open-mindedness, intellectual humility, and intellectual honesty [are] key character traits of interdisciplinary researchers" (Vanney & Sáenz, 2022, p. 9). In this very journal, it has previously been claimed that interdisciplinary

---

[5] We have selected these texts mainly through the literature on the history of inter- and transdisciplinarity (Augsburg, 2014; Bernstein, 2015; Frank, 1988).

research is primarily characterized by the virtue of "reverence" (Arvidson, 2015). Remarkably, these authors who have recently argued for the relevance of interdisciplinary virtues do not mention that proponents of ITD have long emphasized the importance of such virtues. The same is not quite true of the philosopher of interdisciplinarity Jan Schmidt, who situates his recent argument that ITD is necessarily bound up with certain "virtues, mindsets, and habits" within a longer tradition of "critical-reflexive interdisciplinarity" (Schmidt, 2021, p. 123). The main purpose of this article is to historically trace this tradition of ongoing reflection on the virtues of inter- and transdisciplinarity and to highlight its continuing (if mostly unacknowledged) impact on current inter- and transdisciplinary discourse, and practice.

The remainder of this article will consider three successive phases in the historical discourse on inter- and transdisciplinary virtues, which will be addressed chronologically. The first phase (discussed in section 2) was in the 1970s, when talk of ITD and the virtues associated with it first emerged. The second phase (section 3) is staged in the 1990s, when various academic communities, including but not limited to social scientists, continued to propagate ITD as a profoundly ethical endeavor, characterized by a specific "ethos" or "attitude" with a distinctive set of virtues that individual researchers should pursue. Section 4 focuses on twenty-first-century developments, when inter- and transdisciplinary studies became established as a field in its own right, which is also reflected in virtue talk becoming less explicitly normative and less contrasted with disciplinary virtues. In this period, talk of inter- and transdisciplinary virtues such as open-mindedness, flexibility, and creativity persisted. Additionally, collaborative ITD and its corresponding virtues also became a topic of discussion. For each historical stage in the discourse on ITD, we highlight which virtues were considered most relevant in the context of inter- and transdisciplinarity, how these were contrasted with disciplinary virtues (and vices), and what they were based on. Finally, we make some recommendations on how the study of the virtues of ITD can enrich the field of inter- and transdisciplinary studies, including but not limited to the philosophy of ITD.

2. Emerging ITD discourse in the 1970s: Radical alternatives to disciplinarity

By the early 1970s, the notion of "interdisciplinary" research and education had already been circulating for some time (see, e.g. Luszki 1958, as discussed in Frank 1988), when the novel notion of transdisciplinarity became increasingly popular. Proponents of transdisciplinarity wanted to transform science, because they felt that it was no longer properly attuned to the needs of society. They argued that contributing to inter- and transdisciplinary research and education was the ethical thing to do. As historian of transdisciplinarity Jay H. Bernstein has pointed out, the new notion of "transdisciplinarity originated in a critique of the standard configuration of knowledge in disciplines in the curriculum, including moral and ethical concerns" (Bernstein, 2015, p. 1).

A central theme in the ethically charged discourse on transdisciplinarity, which emerged during the early 1970s and became part of a broader discourse on inter- and transdisciplinarity, was the question of what kind of person would be capable of successfully bridging and integrating knowledge from different disciplines. Most of the foundational publications in ITD from the 1970s were written by social scientists who defined both inter- and transdisciplinarity to require "mindsets," "orientations" or "attitudes" that were fundamentally different from, and explicitly contrasted with, those of disciplinary researchers. The inter- and transdisciplinary virtues shaping this "transdisciplinary attitude," especially reflection, creativity, and human and societal concern, were defined primarily in contrast with objectivity and detachment. Advocates of ITD argued that while objectivity and detachment may be considered virtues in some disciplinary contexts, they should be considered vices when seen from the perspective of inter- and transdisciplinary inquiry.

One of the first to make this kind of distinction between inter- and transdisciplinary on the one hand and disciplinary virtues on the other was Jack Lee Mahan, Jr., a young American psychologist who completed his dissertation, "Toward Transdisciplinary Inquiry in the Humane Sciences," in 1970. Although not often cited in the field of inter- and transdisciplinary studies that emerged in the following decades, Mahan's dissertation, which reads as a manifesto,

anticipated many of the features that later came to be seen as central to it, including the idea that inter- and transdisciplinarity require the cultivation of virtues. The main aim of Mahan Jr.'s dissertation was to explore how "a humane (i.e., kind, considerate and humanizing) transdisciplinary orientation [can] be developed to supplement traditional inquiry in the human sciences" (Mahan Jr., 1970, p. 9). He contrasted this orientation with what he saw happening around him in disciplines like psychology, history and sociology. The "professional ethos" of these disciplines, Mahan Jr. argued, was misguided by the principle that "detachment has become a scholarly virtue. It should be noted, however, that complete detachment is an impossibility; moreover, it is a dangerous illusion" (Mahan Jr., 1970, p. 25).[6] Citing the literary scholar Northrop Frye, Mahan presented a radical alternative to this disciplinary ideal, one that embraced the virtues of concern and reflection rather than objectivity and detachment: "concern is a scholarly virtue and a prerequisitie to knowledge … detachment without concern is an immoral virtue," he argued (Mahan Jr., 1970, p. 26). Mahan Jr. further took the stance that a another basic feature of transdisciplinary inquiry ought to be "humanistic reverence for life and human dignity," which he interpreted as "a desire to actively apply knowledge to the betterment of man and society" (Mahan Jr., 1970, pp. 194–195). This orientation, according to Mahan, was difficult to reconcile with the image of a value-free science that was espoused by so many of his colleagues in the human and social sciences.

Simultaneously, but independently of Mahan Jr., a group of distinguished European scholars and scientists also discussed the foundations of inter- and transdisciplinary and came to similar conclusions. This group met at a conference organized by the Centre for Educational Research and Innovation (CERI) in Nice, France, September 7-12, 1970, an event that put the notion of transdisciplinarity on the international intellectual map. The group that met in Nice, which included social scientists such as the Swiss psychologist Jean Piaget (1896–1980),

---

[6] This account of the common orientation in these disciplines was consistent with the self-image of scholars in disciplines such as history and psychology, at least in the postwar United States. In th disciplines, objectivity and detachment, along with carefulness and exactitude, were seen as key virtues (Hajek et al., 2024; Novick, 1988; Rutherford, 2015).

humanities scholars such as the Belgian philosopher Léo Apostel (1925–1995), and natural scientists such as the Austrian astrophysicist Erich Jantsch (1929–1980), reflected Mahan Jr.'s thinking by defining the move toward inter- and transdisciplinarity not simply as a transformation of research and teaching institutions and practices, but as a profound change in the ethos and mores of the academy. For this group of eminent European scholars and scientists, one of the main motivations for reorganizing the disciplinary structures of academic knowledge was related to what they referred to as "pressures for change in the educational system" (Jantsch, 1972b, p. 101). Such demands for change, which were part of the international wave of student protests in the 1960s, had inspired them to revise the academy into one that was not only less internally fragmented, but also more socially engaged and more critically reflexive.

In the preface to the 1972 report of the 1970 conference (Apostel et al., 1972), which promised a "careful analysis of what interdisciplinarity really is," CERI director J.R. Gass stated that current debates about interdisciplinarity offered the university an opportunity for "self-examination," that is, "a good deal of critical and healthy reflection on the inner workings of the university" (Apostel et al., 1972, pp. 9–10). In his personal contribution to the report entitled "Towards Interdisciplinarity and Transdisciplinarity in Education and Innovation," Erich Jantsch further explained what such self-examination—or "self-renewal," as he called it—might look like and how it might differ from the current way of organizing things. Central to Jantsch's argument was his questioning of the epistemic virtue of "objectivity" in the context of the modern university, especially in the social sciences.[7] He called this a "doubtful concept, at least in the domain of the psycho-sciences" (Jantsch, 1972b, p. 108) and criticized the way in which social scientists had adopted the ideal of "objective empiricism" from the physical sciences. According to Jantsch, social science should first and foremost adhere to the human values of "freedom, creativity, and responsibility;" it should not be "value-free" or detached but rather "value-dependent" (Jantsch, 1972b, p. 109). Jantsch's ultimate hope was that the university, led by a social

---

[7] On the history of "objectivity" as an epistemic virtue, see Daston and Galison 2007. On the emergence of "interdisciplinarity" as a leading ideal in the US social sciences, see (Cohen-Cole, 2014).

science that had reinvented itself along these lines, would transform itself from "a passive servant of various elements of society and of individual and even egoistic ambitions of the members of its community into an active institution participating in the process of planning for society." Such a profound transformation, Jantsch argued, "will give the university freedom, dignity, and significance — qualities which have become distorted in a process in which the university is used, but is not expected and not permitted to participate actively" (Jantsch, 1972b, p. 121). For Jantsch, then, the path to inter- and transdisciplinarity was primarily about replacing a scientific ethos centered on passive detachment with one centered on active reflection and intervention in society, a transformation that should begin in the social sciences (see also (Jantsch, 1972a).

Although the writings by Mahan and Jantsch and colleagues were inspired in part by similar social and ethical concerns and provided similar solutions, they did not cite each other. In 1979, however, an important publication in the history of ITD appeared that built directly on both sources. This third text, an edited volume called *Interdisciplinarity and Higher Education* edited by philosopher Joseph J. Kockelmans, aimed to reflect on "the contemporary interdisciplinary movement" at universities (Kockelmans, 1979a, p. vii). A major goal of the book was to provide better historical and philosophical understanding of exactly what was interdisciplinarity and transdisciplinarity, and to provide tools for implementing these forms of knowledge production. In one of two chapters written by Kockelmans himself, called "Why Interdisciplinarity?," he reviewed various stances on the importance of inter- and transdisciplinary research relative to disciplinary forms of inquiry, including Mahan Jr.'s as well as Jantsch's. He agreed with their understanding of "transdisciplinarity ... as a specific attitude." According to Kockelmans, "genuine transdisciplinarity" first of all "implies that one is willing to transcend the limited perspective of one's own discipline" (Kockelmans, 1979b, p. 154). In addition to that, he echoed Mahan's analysis when he defined "reflection" as a key virtue in transdisciplinary research (Kockelmans, 1979b, p. 156). In the end, Kockelmans concluded that "the tension between the world which our sciences describe and the world in which we would actually like to live must be overcome. This cannot be accomplished on the basis of scientific rationality alone; scientific

rationality is to be complemented by a form of critical reflection that is of a typically philosophical nature" (Kockelmans, 1979b, p. 158). Kockelmans thus associated the turn toward ITD in terms of a replacement of rational, scientific with reflective, humanistic values. He had this in common with Mahan Jr. and Jantsch, both of whom had defined the virtues of ITD by distinguishing them from the ideal of a value-free science that they believed prevailed in the physical sciences.

In addition to the main virtues that were contrasted with scientific objectivity, namely reflexivity, societal concern, and creativity, the programmatic texts by these early proponents of ITD also emphasized the important of other virtues, such as the "habit of synthesizing" (Mahan Jr., 1970, pp. 90–91) or "flexibility" (Mahan Jr., 1970, p. 55). Moreover, these early versions of the ideal image of the inter- and transdisciplinarian were designed in contradistinction with specific vices, such as the disciplinary habit of "ethnocentrism" and "in-group partisanship" (Kockelmans, 1979b, p. 133). Together, all of these categories of virtue and vice were part of a discourse about ITD that would be reproduced in later decades, as the next sections will make clear.

3. Emerging ITD communities in the 1990s

The ethical, virtue oriented discourse on inter- and transdisciplinarity from the 1970s reconstructed in the previous section was quite far removed from the academic mainstream, and would remain so for quite some time. Nevertheless, these discussions have been very important in shaping ideal images of inter- and transdisicplinary researchers in later periods, up to and including the current discourse on ITD. Indeed, the writings of scholars such as Jantsch and Kockelmans provided a repertoire from which later generations of scholars reflecting on ITD could draw. As this section will make clear, the discourse of inter- and transdisciplinary virtues that emerged in the 1970s extensively built upon and referenced in the 1990s, when inter- and transdisciplinarity was more firmly established, both as a discourse and institutionally

(Bernstein, 2015, p. 5).

Two major contributions to the literature shaped the discourse on inter- and transdisciplinarity and its associated virtues and attitudes during this new phase in the historical evolution of the discourse on inter- and transdisciplinarity in the 1990s. The first of these contributions, which was argumentative and prescriptive in orientation, was led by the Romanian theoretical physicist Basarab Nicolescu, who at the time was based in Paris. The second defined "transdisciplinarity" as a core feature of a new kind of "Mode 2 knowledge" (Gibbons et al., 1994). This contribution was of a more descriptive nature, as Gibbons and colleagues did not advocate a different responsibility for academia, but rather observed a move towards more contextualized scientific practices that engaged with societal issues and informed policy and described the different means of knowledge production this required and entailed. As Bernstein has pointed out, "the appearance of two nearly simultaneous major statements on transdisciplinarity created something of a buzz and caused many researchers and educators to take notice" (Bernstein, 2015, p. 7). In the context of in this article, it is relevant that these two statements also continued to emphasize the personal, ethical dimensions of inter- and transdisciplinarity, by continuing to associate it with a set of virtues (cf. Augsburg 2014).[8]

In Nicolescu's abstruse yet influential writings, informed by his personal views on the philosophical foundations of quantum mechanics, the ethical dimensions of transdisciplinarity were most explicit. They were particularly clear in the "Charter of Transdisciplinarity," a code of conduct-like document that he wrote with his colleagues Lima de Freitas and Edgar Morin, and which was adopted by the emerging international "community of transdisciplinary researchers" that gathered at the First World Congress of Transdisciplinarity in 1994 in order to outline

---

[8] Our analysis partially overlaps with a well-known 2014 paper by Tanya Augsburg on "The Emergence of the Transdisciplinary Individual," but differs from it in that it looks further back in time and includes more recent statements about inter- and transdisciplinary virtues, attitudes, and mindsets. Moreover, unlike Augsburg, our aim is not to explore "the traits of individuals involved in transdisciplinary projects," but rather to trace historically how these personal characteristics have been defined in different ways in different contexts by different proponents of ITD, including by Augsburg herself.

its "fundamental principles."[9] Adherence to the norms prescribed by the Charter was defined as a "personal moral commitment" (Nicolescu, 2002, p. 148). All who signed the Charter of transdisciplinarity were thus expected to adhere to the norms and principles that it placed at the heart of inter- and transdisciplinary research.

These norms and principles encompassed several virtues. First, the push against objectivity and detachment that Jantsch and Mahan had initiated in the 1970s was continued and intensified, as those who signed the Charter were encouraged to strive for "open-minded rationality" by "re-examining" the role of objectivity in their research (Nicolescu, 2002, p. 149). Other virtues espoused in the 1994 Charter included "intuition, imagination, [and] sensibility" (Nicolescu, 2002, p. 150), as well as "dialogue and discussion" (Nicolescu, 2002, p. 151). Along with three other key virtues, namely "rigor, opening, and tolerance," these were defined as forming "the transdisciplinary attitude," a term that had originated in the work of Kockelmans but was reclaimed and expanded in meaning by Nicolescu and colleagues, who stated that the term had been invented in 1991 by the Argentine poet Roberto Juarroz (Nicolescu, 2002, p. 83). As the Charter explained:

> "Rigor, opening and tolerance are the fundamental characteristics of the transdisciplinary attitude and vision. Rigor in argument, taking into account of all existing data, is the best defense against possible distortions. Opening involves an acceptance of the unknown, the unexpected and the unpredictable. Tolerance implies acknowledging the right to ideas and truths opposed to our own."

While Nicolescu and colleagues did not refer to these transdisciplinary attitudes as "virtues" per se, they did think of tolerance, imagination, dialogue, etc. in terms of what most virtue

---

[9] The Charter was formulated in 1994 and appeared as an appendix to Nicolescu's 1996 *Manifesto of Transdisciplinarity,* which was translated from French into English in 2002 (Nicolescu, 2002).

epistemologists would conceptualize as "virtues," that is, as desirable personal qualities, mind-sets, and attitudes that together formed a "transdisciplinary ethic" (Nicolescu, 2002, p. 151).

Not all texts on the foundations of inter- and transdisciplinarity from the 1990s were as explicit about its ethical implications. Yet, even the more descriptive account on transdisciplinarity by Gibbons et al. (1994) emphasized that the new type of Mode 2 knowledge was based on new "cognitive and social norms" that were replacing older, disciplinary norms: "In Mode 2 new norms are emerging that are appropriate to transdisciplinary knowledge" (Gibbons et al., 1994, p. 9). For example, they observed that "in comparison with Mode 1," by which they meant a ideal of science based on the model of Newtonian physics, "Mode 2 is more socially accountable and reflexive" (Gibbons et al., 1994, p. 3). This emphasis on the virtues of social accountability and reflexivity clearly places their interpretation of ITD in the tradition of Jantsch and Kockelmans. Moreover, there is a continuing tendency in the writings of Gibbons et al. (1994) to point to the reflective humanities (rather than to Newtonian physics) as a source of inspiration for ITD.

In addition to the two foundational texts discussed above, which thus both continued the tradition of linking ITD to virtues that they set apart from disciplinary objectivity, there were several other occasions during the 1990s in which scholars reflected on the foundations of ITD, reaching similar conclusions and championing similar virtues. For example, in a 1999 edited volume on interdisciplinarity, the physicist and philosopher John Ziman (1925–2005) spoke about a "transdisciplinary ethos" which he associated with "creativity" and "originality" and distinguished from the "tribalism" and "conformity" that he observed to reign within disciplinary communities (Ziman, 1999, pp. 73, 81). In the same volume, a colleague of Ziman associated ITD with the virtue of "open-mindedness" and contrasted it with the intellectual vices of "ignorance" and "arrogance" prevalent in disciplinary contexts (Boden, 1999, pp. 22–23).

4. 21st-century reproductions of ITD virtues

As should have become clear in the previous sections, the view that certain personal qualities, mindsets, and attitudes of individual researchers, or virtues, were crucial in the context of ITD was expressed consistently from the 1970s to the 1990s. In the 2000s, ITD scholarship became more mainstream and institutionally established, as manifested by a sharp increase in the use of the terms interdisciplinarity and transdisciplinarity[10], and the publication of the first editions of ITD handbooks, such as *The Oxford Handbook of Interdisciplinarity* (Frodeman et al., 2010), *Interdisciplinary Research: Process and Theory* (Repko, 2008), and the *Handbook of Transdisciplinary Research* (Hirsch Hadorn, 2008). This demonstrates that ITD studies has started to increasingly function as an autonomous field of research.

The discourse of virtues seems to have become less prominent in the reports on ITD in the 21st century than in the earlier waves in the 1970s and 1990s. A limited proportion of the large number of publications explicitly refer to personal qualities for ITD; the focus seems to have shifted away from the ITD individual and towards the practice of ITD research. For example, in their handbook that provides a step-by-step approach to interdisciplinary research processes, Repko & Szostak (2021) argued that "the objective of the interdisciplinary research process is pragmatic" (9), "the implication for interdisciplinary work is that we need to be aware of our biases, including disciplinary biases" (17), and "the interdisciplinary research process is also reflexive" (81). As such, they deploy a rhetoric of ideal-typical *processes* and *behaviours*, rather than of *personal qualities*.[11] When individual qualities *do* receive explicit attention in 2000s ITD literature, they are on occasion referred to as virtues (e.g. Augsburg, 2014; Giri, 2002) but more commonly adopted terminologies include mindsets, attitudes, or even large umbrella terms such as competencies (e.g. Guimarães et al., 2019; Horn et al., 2022).

From time to time, argumentative, philosophical texts appear in which interdisciplinarity and/or transdisciplinarity are associated with a particular set of virtues, attitudes, and

---

[10] The more widespread adoption of the terms inter- and transdisciplinarity is illustrated by the increase in their use in books, see: https://books.google.com/ngrams/graph?content=interdisciplinarity%2C+transdisciplinarity&year_start=1800&year_end=2019&corpus=en-2019&smoothing=3

[11] Hajek et al. (2024) have observed a similar shift has been observed within the disciplinary discourses of history, psychology, and physics during the late-twentieth century.

mindsets. For example, a chapter in the aforementioned *Oxford Handbook* focused on the "practical ethics of interdisciplinarity," which presented the pursuit of the following five intellectual virtues as essential to interdisciplinary, collaborative work: generosity, confidence, humility, flexibility, and integrity (Balsamo & Mitcham, 2010, p. 270). To take another example, in a widely cited paper from 2002 in *Futures*, Ananta Kumar Giri listed a number of "virtues that need to be cultivated in order to participate in ... transdisciplinarity," including the virtues of "dialogue," "openness," and "courage." Moreover, Giri warned against the vice of "disciplinary chauvinism" (Giri, 2002, p. 105), much in the same way as Mahan Jr. had warned against disciplinary ethnocentrism decades earlier.

In addition to argumentative pieces like Giri's, the ITD literature of the 2000s and 2010s was also characterized by a second stream of texts in which the authors associated ITD with key attitudes, mindsets and virtues. This second type of study was more empirically oriented: it tapped into the wealth of examples of ITD research practices that emerged as a consequence of the mainstreaming of ITD scholarship. For example, Bruce et al. (2004) reported virtues such as flexibility, adaptability, creativity, openness, and curiosity, while Guimaraes et al (2019) listed virtues such as openness, tolerance, adaptability, flexibility and humility. These are consistent with the virtues advocated in the reports dating back to the 1970s, such as Kockelmans' (1979b, 154) call for a willingness to acknowledge and transcend the limitations of one's own discipline. Furthermore, Guimareas et al (2019) stressed the additional importance of a "desire to engage with issues in the non-academic world," which is consistent with the shift towards Mode-2 knowledge production in the 1990s, but also with the Mahan's (1970) mention of 'concern'. Both Bruce et al (2004) and Guimaraes et al (2019) emphasize the importance of criticality and reflexivity, echoing the critical stance towards one's own perspectives advocated by Apostel (1972).

Although much has remained the same since the emergence of a discourse on ITD in the 1970s, we also observed some differences in the virtue talk across periods. First, more recent reports also included virtues that were less prominent in the earlier texts. In particular, Bruce et

al. (2004) emphasized the collaborative nature of ITD and highlighted the importance of virtues such as being "a good teamworker" (p. 464). This was also reflected in the overlap and interaction between the ITD and Team Sciences scholarly communities in recent years. The team science handbook '*Strategies for Team Science Success*' includes a chapter on individual-level competencies for ITD team collaboration, in which Nurius and Kemp (2019) distinguished interpersonal competencies as a fourth essential for ITD collaborations alongside (1) values, attitudes, and beliefs, (2) habits of mind, and (3) knowledge-based competencies. This accentuates that an additional set of virtues seems to have become more prominent in the discourse traced in this article: interpersonal and collaborative virtues. Second, some ITD scholars seem to deemphasize the virtue of rigor highlighted by Nicolescu's Charter. The *Handbook of Transdisciplinary Research* opens with a statement that by engaging in transdisciplinary research "academic standards of knowledge production and quality control criteria are sacrificed" (Hirsch Hadorn, 2008, p. 3).

In addition, we also observe a shift in the approaches, tone of voice, and positionality of authors reporting on ITD virtues compared to the earlier reports: much of the 21st-century literature on ITD virtues has taken a more descriptive course, reporting on the key assets required for inter- and transdisciplinary practice based on literature reviews and/or empirical findings. The literature reviews tend to refer explicitly to the earlier work on ITD from the 1970s and 1990s; which may (partly) explain the overlap of virtues reported across time periods. The empirical studies used questionnaires, interviews, and group discussions to gather evidence on the ITD virtues that were and considered and experienced as important by those engaged in ITD research and who identified themselves as ITDR researchers. As such, these reports do not take an explicit stance on the desirability of particular virtues. To our surprise, even sources that self-identified as handbooks, such as the *Oxford Handbook of Interdisciplinarity* (2010) and *Handbook of Transdisciplinary Research* (2008), adopted a predominantly descriptive discourse by collecting case studies and examples. As such, they do not take an explicit, normative stance on

the roles and responsibilities of academics or the academic system in ITD and the (un)desirability of particular virtues or vices.

5. Concluding remarks

Virtue talk has long occupied a central place in the discourse on inter- and transdisciplinarity. Since the emergence of this discourse in the early 1970s and its expansion in the early 1990s, the idea that ITD requires certain virtuous personal qualities, mindsets, and attitudes has been consistently emphasized. Although there has been a striking continuity in the terms used to describe the personal, ethical dimensions of ITD—the virtues of reflexivity and creativity being the most recurrent—we also observed a number of changes over time in this discourse of interdisciplinary virtues. Initially, the most prominent in virtue talk included reflexivity, responsibility, and creativity, which were consistently contrasted with disciplinary virtues, especially objectivity and detachment. Later, several other virtues, such as open-mindedness and flexibility, and even later teamwork, were added to the ideal image of the inter- or transdisciplinarian. Meanwhile, the opposition between interdisciplinary virtues and objectivity seems to have gradually receded and an additional focus on collaborative ITD seems to have emerged more recently.

The greater emphasis on personal qualities and virtues in the earlier literature is well understood as rhetorical utility of "virtue talk" (Hajek et al., 2024) for the first generations of ITD scholars who established ITD in relation to and in response to other forms and communities of knowledge. Historical research suggests that talk about scholarly virtues (and vices) emerges particularly at times when established ideals of scholarship are being challenged and new ones are being defined, or when disciplinary structures are being consolidated (Engberts & Paul, 2017; see, for example, ten Hagen & Paul, 2023; Wang, 2017). This was clearly the case in the 1970s, when inter- and transdisciplinarians defined ITD as a new way of organizing and generating knowledge and explicitly distinguished it from mainstream forms of research, particularly from traditions that were perceived as too narrowly "objective" and "detached," and insufficiently concerned with the betterment of man and society. Virtue talk was thus particularly

16

relevant in the context of what sociologist Thomas Gieryn (1983) has termed "boundary work," defined as "a strategy of contrasting one's own scholarly standards with the perceived deficiencies of a real or imagined "other" (Gieryn, 1983; paraphrased in ten Hagen & Paul, 2023, p. 282). In the 1990s, the virtues of ITD, including reflexivity and creativity, continued to be relevant for those describing and defining new "modes of knowledge," such as Gibbons et al. It also allowed ITD enthusiasts like Nicolescu to create further cohesion within an emerging research community of inter- and transdisciplinarians.

All of the above ITD virtues are still prominent in the literature on ITD. In fact, since about 2000, we have observed that the discourse on interdisciplinary virtues seems to saturate, with the importance of the same virtues such as reflexivity, creativity, and open-mindedness being repeatedly reiterated, reaffirmed and reproduced. Empirical studies based on self-reporting by scholars of ITD and literature reviews based on foundational texts from the 1970 and 1990s reflect and reinforce statements about the nature of ITD and ITD virtues, and vice versa. The observation that the findings from descriptive, empirical studies of ITD virtues in the 21st century largely echo the virtues advocated in more prescriptive and explicitly normative outlets from the 1970s and 1990s may imply gravitation towards a consensus on which virtues are key for ITD. Such consensus, in turn, may signify the increasingly disciplined status of the field of ITD studies, with the key virtues of ITD as one of its key underpinning assumptions.

So, we consider the evolution of virtue talk in the ITD literature indicative of the field being in a phase of disciplinary consolidation. While this offers the potential for the field to mature – through acceptance, institutional embedding, education and training, career opportunities, and belonging to a scholarly community (Bammer, 2017) – it also carries the risk of developing blind spots for collective assumptions. As such, the current phase of consolidation may make the field of ITD studies vulnerable to the same pitfalls that it cautions against in dealing with established disciplines, such as being unaware of or not critically examining (implicit) assumptions. We, therefore, argue that our findings urge that ITD virtues be, become, and remain subject to the critical reflection that is so central to ITD. To this end, we call on (1) ITD scholars to

continually and critically reflect on their own assumptions; (2) scholars from fields such as science and technology studies (STS), history of science and philosophy of science to continue to study ITD practices from their distanced and critical positions; and (3) these different scholarly communities to engage in constructive dialogue with each other and to prevent their literatures and discourses from dissociating.

What is particularly lacking, to our knowledge, are empirical studies of how certain virtues actually hinder or benefit practices of inter- and transdisciplinary research and education. Yet it is precisely these insights that have the potential to provide a solid basis for claims about the importance of virtues for ITD research, and thereby challenge and substantiate assumptions. There is no lack of philosophical arguments in favor of specific images of the ideal inter- or transdisciplinarian, nor does the literature fall short of case descriptions and self-report of perceptions and experiences. However, studies that succeed in anchoring these ideal images in ITD practices remain scarce. We therefore argue for a closer collaboration between those who study ITD from within and from a distance, and for more explicit links between philosophical reflections on ITD and empirical studies of its practices. We suggest ethnographic approaches such as those employed by Nersessian (2022), MacLeod & Nagatsu (2018), and Horn et al. (2023) as possible means of making those connections and taking empirical studies of ITD virtues beyond self-report. More specifically, philosopher of science and cognitive scientist Nancy Nersessian (2022) has already empirically demonstrated the importance of several "interdisciplinary epistemic virtues," including flexibility, interactional expertise, and awareness, based on twenty years of ethnographic research in interdisciplinary research labs. We believe that her approach, which she calls "cognitive ethnography," deserves wider attention and expansion (Nersessian 2022; see also Nersessian 2019).

What our article has attempted to do is to provide a solid historical foundation for further, empirically informed research on the virtues of inter- and transdisciplinarity. Such research would enrich not only the field of ITD studies as a whole, but also the emerging philosophy of

interdisciplinarity. For we agree with Jan Schmidt that interdisciplinarity and its philosophy should be "critical-reflexive" (Schmidt, 2021, p. 123), but also with Uskali Mäki that the philosophy of interdisciplinarity must be "emphatically empirical" (Mäki, 2016, p. 328).

Works cited

Apostel, L., Berger, G., Briggs, A., & Michaud, G. (Eds.). (1972). *Interdisciplinarity: Problems of Teaching and Research in Universities*. Organization for Economic Co-Operation and Development.

Arvidson, P. S. (2015). The virtue of reverence in interdisciplinary studies. *Issues in Interdisciplinary Studies*, *33*, 117–143.

Augsburg, T. (2014). Becoming Transdisciplinary: The Emergence of the Transdisciplinary Individual. *World Futures*, *70*(3–4), 233–247. https://doi.org/10.1080/02604027.2014.934639

Balsamo, A., & Mitcham, C. (2010). Interdisciplinarity in ethics and the ethics of interdisciplinarity. In R. Frodeman, J. Thompson Klein, C. Mitcham, & J. B. Holbrook (Eds.), *The Oxford Handbook of Interdisciplinarity* (pp. 259–272). Oxford University Press.

Bammer, G. (2017). Should we discipline interdisciplinarity? *Palgrave Communications*, *3*(1), 1–4.

Bernstein, J. H. (2015). Transdisciplinarity: A review of its origins, development, and current issues. *Journal of Research Practice*, *11*(1), Article R1.

Boden, M. A. (1999). What is Interdisciplinarity? In R. Cunningham (Ed.), *Interdisciplinarity and the Organisation of Knowledge in Europe* (pp. 13–24). European Communities.

Bruce, A., Lyall, C., Tait, J., & Williams, R. (2004). Interdisciplinary integration in Europe: The case of the Fifth Framework programme. *Futures*, *36*(4), 457–470.

Cohen-Cole, J. (2014). *The open mind: Cold War politics and the sciences of human nature*. University of Chicago Press.

Daston, L., & Galison, P. (2007). *Objectivity*. Zone Books.

Engberts, C. A., & Paul, H. (2017). Scholarly Vices: Boundary Work in Nineteenth-Century Orientalism. In J. van Dongen & H. Paul (Eds.), *Epistemic Virtues in the Sciences and the Humanities* (pp. 79–90). Springer.

Frank, R. (1988). "Interdisciplinary": The First Half Century. *Issues in Interdisciplinary Studies*, *6*, 139–151.

Frodeman, R., Thompson Klein, J., Mitcham, C., & Holbrook, J. B. (Eds.). (2010). *The Oxford Handbook of Interdisciplinarity*. Oxford University Press.

Gibbons, M., Limoges, C., Scott, P., Schwartzman, S., & Nowotny, H. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. Sage.

Gieryn, T. F. (1983). Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American Sociological Review*, *48*(6), 781–795.

Giri, A. K. (2002). The calling of a creative transdisciplinarity. *Futures*, *34*(1), 103–115.

Guimarães, M. H., Pohl, C., Bina, O., & Varanda, M. (2019). Who is doing inter-and transdisciplinary research, and why? An empirical study of motivations, attitudes, skills, and behaviours. *Futures*, *112*, 102441.

Hajek, K. M., Paul, H., & Ten Hagen, S. (2024). Objectivity, honesty, and integrity: How American scientists talked about their virtues, 1945–2000. *History of Science*. https://doi.org/10.1177/00732753231206773

Hirsch Hadorn, G. (Ed.). (2008). *Handbook of transdisciplinary research*. Springer.

Horn, A., Urias, E., Klein, J. T., Hess, A., & Zweekhorst, M. B. M. (2023). Expert and non-expert at the same time: Knowledge integration processes and dynamics in interdisciplinary teamwork. *Sustainability Science*, *18*(5), 2357–2371. https://doi.org/10.1007/s11625-023-01365-6

Horn, A., Urias, E., & Zweekhorst, M. B. M. (2022). Epistemic Stability and Epistemic Adaptability: Interdisciplinary Knowledge Integration Competencies for Complex

Sustainability Issues. *Sustainability Science*, *17*, 1959–1976.

https://doi.org/10.1007/s11625-022-01113-2

Jantsch, E. (1972a). Inter-and transdisciplinary university: A systems approach to education and

innovation. *Higher Education*, *1*(1), 7–37.

Jantsch, E. (1972b). Towards Interdisciplinarity and Transdisciplinarity in Education and Inno-

vation. In L. Apostel, G. Berger, A. Briggs, & G. Michaud (Eds.), *Interdisciplinarity:*

Problems of Teaching and Research in Universities (pp. 97–121). Organization for Eco-

nomic Co-Operation and Development.

Kidd, I. J. (2021). A Case for an Historical Vice Epistemology. *HUMANA.MENTE Journal of*

Philosophical Studies, *14*(39), 69–86.

Klein, J. T. (2014). Discourses of transdisciplinarity: Looking back to the future. *Futures*, *63*,

68–74.

Kockelmans, J. J. (Ed.). (1979a). *Interdisciplinarity and higher education*. The Pennsylvania

State University Press.

Kockelmans, J. J. (1979b). Why Interdisciplinarity? In J. J. Kockelmans (Ed.), *Interdiscipli-*

narity and higher education (pp. 123–160). The Pennsylvania State University Press.

Luszki, M. (1958). *Interdisciplinary Team Research: Methods and Problems*. National Training

Laboratories.

MacLeod, M., & Nagatsu, M. (2018). What does interdisciplinarity look like in practice: Map-

ping interdisciplinarity and its limits in the environmental sciences. *Studies in History*

and Philosophy of Science Part A, *67*, 74–84.

https://doi.org/10.1016/j.shpsa.2018.01.001

Mahan Jr., J. L. (1970). *Toward Transdisciplinary Inquiry in the Humane Sciences*. United

States International University.

Mäki, U. (2016). Philosophy of interdisciplinarity. What? Why? How? *European Journal for*

Philosophy of Science, *6*, 327–342.

Nersessian, N. J. (2019). Interdisciplinarities in action: Cognitive Ethnography of bioengineering sciences research laboratories. *Perspectives on Science*, *27*(4), 553–581.

Nersessian, N. J. (2022). *Interdisciplinarity in the making: Models and methods in frontier science*. MIT Press.

Nicolescu, B. (2002). *Manifesto of Transdisciplinarity* (K.-C. Voss, Trans.). State University of New York Press.

Novick, P. (1988). *That Noble Dream: The "Objectivity" Question and the American Historical Profession*. Cambridge University Press.

Nurius, P. S., & Kemp, S. P. (2019). Individual-Level Competencies for Team Collaboration with Cross-Disciplinary Researchers and Stakeholders. In K. L. Hall, A. L. Vogel, & R. T. Croyle (Eds.), *Strategies for Team Science Success* (pp. 171–188). Springer.

Paul, H. (2017). Virtue language in nineteenth-century orientalism: A case study in historical epistemology. *Modern Intellectual History*, *14*(3), 689–715.

Repko, A. F. (2008). *Interdisciplinary research: Process and theory*. SAGE.

Repko, A. F., & Szostak, R. (2021). *Interdisciplinary research: Process and theory* (Fourth edition). SAGE.

Rutherford, A. (2015). Maintaining Masculinity in Mid-Twentieth-Century American Psychology: Edwin Boring, Scientific Eminence, and the "Woman Problem." *Osiris*, *30*(1), 250–271. https://doi.org/10.1086/683022

Schmidt, J. C. (2021). *Philosophy of Interdisciplinarity: Studies in Science, Society and Sustainability*. Routledge.

ten Hagen, S., & Paul, H. (2023). The Icarus flight of speculation: Philosophers' vices as perceived by nineteenth-century historians and physicists. *Metaphilosophy*, *54*(2–3), 280–294.

Vanney, C. E., & Sáenz, J. I. A. (2022). The intellectual character of interdisciplinary researchers. *Scientia et Fides*, *10*(2), 7–20.

Wang, J. (2017). "Broken Symmetry": Physics, Aesthetics, and Moral Virtue in Nuclear Age

    America. In J. van Dongen & H. Paul (Eds.), *Epistemic Virtues in the Sciences and the*

    Humanities (pp. 27–47). Springer.

Ziman, J. (1999). Disciplinarity and Interdisciplinarity in Research. In R. Cunningham (Ed.),

    Interdisciplinarity and the Organisation of Knowledge in Europe (pp. 71–82). European

    Communities.