Virtues of Inter- and Transdisciplinarity: A Historical Analysis of the Emergence, Consolidation and Saturation of Virtue Discourses

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Abstract – Which attitudes, mindsets, and personal qualities do scholars deem crucial for inter- and transdisciplinary (ITD) research? And how has this changed over time? In this article, we answer these questions by looking at foundational texts on inter- and transdisciplinarity published between the 1970s and the early 2000s. We show that virtues such as reflexivity, responsibility, and creativity were prominent in both early and more recent ITD literature. Although additional virtues – including open-mindedness, flexibility and being a good teamworker – came into focus later, the virtues that were considered important seem surprisingly stable over time. This saturation of the discourses on virtues was indicative of ITD studies becoming an established research field in an of its own. 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 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 consolidation as a distinct research field. We argue that this also puts the field at risk of developing blind spots for collective assumptions. We therefore 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 frame their educational goals. 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. In particular, they want them to "develop the courage to work as trailblazers in uncertain and unknown situations." They also expect them to become 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 critically examines how and why this talk about qualities, attitudes, and mindsets—here referred to as *virtues*—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, are inter- and transdisciplinary virtues taken to be different from disciplinary ones? What does the evolution of talk about (inter-)disciplinary virtues tell us about the evolution of thinking about ITD itself?

[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).

The present article is based on a close reading and historical contextualization of a series of foundational texts on inter- and transdisciplinarity from the 1970s onwards, focusing on how the perceived need for specific virtues for ITD has evolved.[4]

It is important to recognize that the terms inter- and transdisciplinarity are used heterogeneously and carry different meanings. This diversity includes changes in definitions over time — such as the recent shift in the understanding of transdisciplinarity to include non-academic knowledges and knowledge holders — as well as the simultaneous use of different definitions. Examples of the latter kind of heterogeneity include the distinction between "interdisciplinarity in the specific sense" and "interdisciplinarity in the generic sense" by Huutoniemi et al (2010) and between "instrumentalist" and "critical-reflexive" interdisciplinarity by Schmidt (2022). In our historical and philosophical analysis of the discourse on inter- and transdisciplinary virtues, we have focused on texts in which the authors themselves, scholars who studied and/or engaged in ITD, use the terms inter- and/or transdisciplinarity, regardless of the meanings they attached to them. Thus, rather than wielding a specific definition of ITD ourselves, we thus examine "inter- and transdisciplinarity in a generic sense," considering a range of practices that cross disciplinary boundaries and refer to inter- and transdisciplinarity as a single construct: ITD. Keeping ITD only loosely defined for the purposes of this study has also allowed us to use virtues as a lens to understand how notions of ITD have changed over time.

In analyzing the historical discourse on ITD, we draw on the philosophical framework of virtue epistemology. In line with Linda Zagzebski (1996) and other so-called “virtue responsibilists” (see Battaly, 2008), we understand virtues as personal qualities, mindsets, character

[4] We have selected these texts mainly through the literature on the history of inter- and transdisciplinarity (Augsburg, 2014; Bernstein, 2015; Frank, 1988). Our analysis partially overlaps with Augsburg work 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.

traits, orientations, and attitudes; within scholarly communities of researchers, virtues function as social and cognitive norms that link ethics and epistemology. Put another way, *scholarly virtues* (also known in the philosophical literature as *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, curiosity, creativity, honesty, humility, and open-mindedness.

All of these virtues have a history. There have been times and circumstances when they were not necessarily considered virtues, or in some cases, like curiosity or humility, were even considered vices. Moreover, what scholars and scientists consider a virtue today may not always remain a virtue, depending on the broader cultural and political contexts in which they operate. Keeping this in mind, our article aims to contribute to a broader "historical virtue epistemology" (Paul 2017; see also Kidd 2021). While historical epistemology is concerned with “the history of categories that structure our thought, pattern our arguments and proofs, and certify our standards for explanation" (Paul 2017, 692, citing Daston 1991, 282), a historical *virtue* epistemology examines the (dis)continuities of epistemic virtues over time and how they have shaped ideals and practices of knowledge.

Although virtue epistemology as a philosophical field emerged only in the 1990s, scholars and scientists have long addressed the fundamental philosophical question of what makes an excellent researcher by pointing to their desired virtues (see e.g. Hajek et al., 2024; Engberts, 2021, which trace virtue language across the nineteenth and twentieth centuries). As we demonstrate in this article, this holds even more true for the history of inter- and transdisciplinary studies, which has always been remarkably rich in virtue talk.

Contemporary philosophical reflection on the virtues of (inter- and transdisciplinary) research can be enriched by engaging with these historical discourses. For example, an historical virtue epistemology can shed light on the changing meaning of individual virtues as well as on the social and cultural circumstances in which they are most relevant in scientific practice (as

also argued in Ten Hagen and Paul, 2023). Engaging with this history might even prevent virtue epistemologists from reinventing the wheel.

Recent reflections on the virtues of ITD have often overlooked their historical dimension. 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, see also Arvidson 2015). But they do not mention that proponents of ITD have long emphasized the importance of these particular virtues. The exception is Jan Schmidt's recent work in the philosophy of interdisciplinarity, which situates his argument for a "critical-reflexive interdisciplinarity" (Schmidt, 2022, p. 123) within a broader historical tradition.

The main aims of this article are (i) to historically and critically trace this decades-long tradition of ongoing reflection on the virtues of inter- and transdisciplinarity, (ii) to highlight its continuing (though mostly unacknowledged) impact on current inter- and transdisciplinary discourse and practice, and (iii) to provide a solid historical foundation for further, empirically informed philosophical 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.

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. In section 5 we present an interpretation of the patterns that we observed across the time periods and make sense of the implications of this evolution of virtue talk for the field of ITD research. 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 (see also 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 doctorated with a thesis on transdisciplinarity in 1970. Although not often cited in the field of ITD 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 both inter- and transdisciplinarity require the cultivation of specific virtues. Mahan Jr.'s main aim 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” (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" (Ibid., p. 25).[5] Mahan Jr’s radical alternative to the traditional ideal of an objective and detached science, which he deemed impossible in practice, embraced the virtues of "concern" and "reflection" instead (Ibid., p. 26). He further argued 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" (Ibid., pp. 194–195).

Mahan Jr. notion of a transdisciplinary orientation, centered on the leading virtues of concern, reflection, and reverence, stood in stark contrast to the prevailing and increasingly

[5] 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).

popular view of science at the time. Typically associated with sociologist of science Robert Merton, this view interpreted objectivity as a strict adherence to the scientific method and emphasized the value of disinterestedness. It pushed back against the individualistic, Romantic image of the scientist as someone with outstanding personal qualities, or indeed virtues (see Shapin, 2008, 21–23). Mahan and later proponents of ITD clearly felt that something important was lost with this new ideal of the objective, disinterested scientist. Mahan's framing of ITD in terms of invididual attitudes, orientations, and virtues thus represented a departure from dominant ideals of science as an impersonal endeavor.

Simultaneously, but independently of Mahan Jr., a group of distinguished European scholars and scientists also discussed the foundations of inter- and transdisciplinary and reached 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, including Swiss sociologist Jean Piaget, Belgian philosopher Léo Apostel, and Austrian astrophysicist Erich Jantsch among others, 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. 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 conference, 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, 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 univeristy, especially in the social sciences.[6] He called this a "doubtful concept" (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" but "value-dependent" (Jantsch, 1972b, p. 109). Jantsch's ultimate hope was that the university, led by a more interdisciplinary social 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" (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 and philosophy 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" observed at American 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

[6] 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).

attitude." According to Kockelmans, "genuine transdisciplinarity" first of all "implies that one is willing to 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 an alternative to "scientific rationality" (1979b, p. 156, 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. This illustrates that the foundations of ITD, as first developed in the 1970s, were rooted in humanistic and philosophical knowledge traditions, rather than the natural sciences. In later iterations of ITD, shaped more by sustainability concerns and neoliberal agendas than by morally charged calls for social change, this emphasis would shift.[7] What is also philosophically intriguing about these writings from the 1970s is the way they demonstrate that epistemic categories such as detachment and objectivity—often seen as virtues—can, depending one's beliefs and academic background, also be framed as vices. This underscores the idea that epistemic virtues, just like any social norm, are not universal but contextual.

In addition to the main virtues that were contrasted with scientific objectivity and rationality, namely reflexivity, societal concern, and creativity, the programmatic texts by these early proponents of ITD also emphasized the importance of other virtues, such as the "habit of synthesizing" (Mahan Jr., 1970, pp. 90–91) and "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 epistemic categories of virtue and vice were part of a discourse about ITD that would be reproduced in later decades, as

[7] For a philosophical critique of the currently predominant, instrumentalist account of ITD, see Schmidt, 2022.

the next sections will make clear.

3. Consolidating virtue discourses in the 1990s

The writings of scholars such as Jantsch and Kockelmans provided a repertoire from which later generations of scholars reflecting on ITD could draw: the discourse of inter- and transdisciplinary virtues that emerged in the 1970s was extensively built upon and referenced in the 1990s, when ITD was more firmly established, both as a discourse and institutionally (Bernstein, 2015, p. 5).

Three major contributions to the literature from the 1990s further established the idea that ITD requires certain virtues and attitudes. A first key publication in this regard was Julie Thompson Klein's *Interdisciplinarity: History, Theory, Practice* (1990). Drawing on the work of Mahan, Jantsch, and Kockelmans, among many other early inter- and transdisciplinarians, Klein's aim in this book was to provide a synthesis of previous thinking on ITD and thus "a sound framework for future discussion and research" (Klein, 1990, p. 14). One of the questions Klein felt should be central to the coherent field of inquiry on ITD that she envisioned in her book was: "what qualities characterize 'an interdisciplinary person'?" (Klein, 1990, p. 15). Similar to Kockelmans, Klein emphasized that inter- and transdisciplinarians are characterized by their broad interests, as well as by their synthetic abilities and "hermeneutical" qualities (Ibid., p. 186). In later publications, Klein continued to stress that ITD should be understood not only as a practice but also as an "attitude" (see, e.g. Klein, 2004, p. 521; 2014, p. 73).

Another important figure in the consolidation of this fundamental idea was the Romanian physicist Basarab Nicolescu. In Nicolescu's writings—which are abstruse but nonetheless highly influential, especially in southern Europe and Latin America, and which are 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 its "fundamental principles."[8] 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 (2002, p. 83). While Nicolescu and colleagues did not refer to the transdisciplinary attitude as being comprised of "virtues" per se, they did think of tolerance, imagination, dialogue, etc. in terms of what virtue epistemologists have conceptualized as "virtues," that is, as desirable personal qualities, mindsets, and attitudes that together formed a "transdisciplinary ethic" (Nicolescu, 2002, p. 151).

The third influential publication that associated ITD with specific virtues, if in a more descriptive and less normative manner than Nicolescu and colleagues, defined "transdisciplinarity" as a core feature of a new kind of "Mode 2 knowledge" (Gibbons et al., 1994). They argued 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

[8] 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).

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.

The foundational texts discussed above continued the tradition of linking ITD with specific virtues, while also contrasting these virtues with the more conventional scientific virtues, such as objectivity, which were often also interpreted as typically disciplinary virtues. All in all, we have seen that the philosophical view—now widely accepted among virtue epistemologists—that certain personal qualities are crucial to the production of sound knowledge was thus widely cultivated within the emerging community of scholars concerned with ITD from the 1970s through the 1990s.

4. Saturating virtue discourses in the twenty-first century

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,[9] 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 by this time, ITD studies had increasingly begun to function as an autonomous and more coherent field of inquiry, much as Klein had envisioned in the early 1990s.

The discourse of virtues seems to have become less prominent in the reports on ITD in

[9] 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

the twenty-first century than in the earlier waves in the 1970s and 1990s; the focus shifted away from the ITD individual and towards its practice. For example, in their handbook that provides a step-by-step approach to the Interdisciplinary Research Process, 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*.[10] 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 large umbrella terms such as competencies (e.g. Guimarães et al., 2019; Horn et al., 2022).

In general, the relationship between ITD and disciplinary virtues also seems to have shifted in the 2000s. Authors no longer present the virtues of ITD as remedies for the shortcomings of disciplinary cultures. Instead, the virtues of ITD are increasingly presented as norms that should complement rather than replace disciplinary standards. For example, the *Handbook of Transdisciplinary Research* begins by stating that by engaging in transdisciplinary research "academic standards of knowledge production and quality control criteria are sacrificed" (Hirsch Hadorn, 2008, p. 3). They argue that embracing and pursuing ITD virtues automatically and inevitably comes at the expense of more traditional scientific and disciplinary values. This indicates that the authors who advocate ITD in this handbook also see value in disciplinary virtues; they weigh the advantages and disadvantages of adopting ITD virtues. This evolution of ITD virtue talk seems indicative of a shift away from thinking of ITD as a radical replacement of traditional or discipline-oriented research towards a discourse of complementarity of ITD and disciplinarity as co-existing and mutually reinforcing approaches to scientific research.

[10] 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.

From time to time, texts on ITD from the 2000s promote a particular set of virtues, attitudes, and 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 for collaborative interdisciplinary 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. They thus explicitly and normatively advocate for certain virtues, and against vices.

In addition to argumentative pieces like Giri's, the ITD literature of the 2000s and 2010s was also characterized by a second type of study which 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. Those also often included literature reviews in which they cited works from the 1970s and/or 1990s described in the previous two sections, that informed their data collection and analysis. Going by the name of competencies or attitudes, the empirical works report key virtues for ITD that are very similar to what we saw in the 1970s and 1990s. There are myriad examples, but to just name a few: Bruce et al (2004) reported virtues such as flexibility, adaptability, creativity, openness, and curiosity, Guimaraes et al (2019) listed virtues such as openness, tolerance, adaptability, flexibility and humility and Hoffmann et al (2022) list openness, curiosity, creativity, persistence, patiences, reflexivity, modesty 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, and 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 since the 1970s.

Although the list of ITD virtues has largely 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. Particularly, more recent reports also included virtues that were less prominent in the earlier texts. 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 accentuates that an additional set of virtues seems to have become more prominent in the discourse traced in this article: interpersonal and collaborative virtues.

Finally, 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 twenty-first-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 ITD researchers. As such, these authors describe what others report, but do not themselves take an explicit stance on the desirability of particular virtues but rather report te qualities that literature and respondents provide. 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. Historical interpretation: ITD as a consolidating research field

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 the willingness and ability to engage in teamwork, were added to the ideal image of the inter- or transdisciplinarian.

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 response to other forms and communities of knowledge. Historical research on the evolution of disciplines in the sciences and humanities suggests that talk about scholarly virtues (and vices) emerges particularly at times when established disciplinary 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 from the 1970s through the 1990s, 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 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). As such, virtues were

part of a rhetorical language used to define ITD as a legitimate academic field and practice (see also Klein, 2014, p. 69).

In recent years, the discourse on virtues in the ITD literature seems to have reached a state of saturation: there seems to be less and less discussion and more and more consensus about the required personal qualities of inter- or transdisciplinary researchers. The descriptive, empirical studies of ITD virtues in the twenty-first century still largely echo, rather than interrogate, the virtues advocated in the more prescriptive and explicitly normative publications of the 1970s and 1990s. This may signify a gravitation towards a consensus about which virtues are key to ITD, a consensus that has served as a key foundation for the consolidation of the field of ITD as a whole. While this consolidation 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, including on the fundamental question of which virtues are conducive to inter- and transdisciplinary research. In other words, the recent saturation of virtue talk within the scholarly literature on ITD makes the field 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 argue, therefore, 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 history of science and philosophy of science to continue to subject ITD practices to critical examination from their distanced positions; and (3) these different scholarly communities to engage in constructive dialogue with each other and to prevent their literatures and discourses from dissociating.

Finally, we also observe that studies that succeed in anchoring idealtypical images of ITD in actual ITD practices remain scarce. 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. 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 and "empirical studies [that] shed a partial and fragmented light on interdisciplinary cognition" (Mansilla, 2017, p. 264).

6. Conclusion and discussion

In this study we have provided insights into the evolution of virtue talk in accounts of ITD that are also indicative of the evolution of thinking and writing about ITD itself. The majority of virtues – albeit under different names – remained relatively stable, at least in part mediated by the adoption of claims from older, prescriptive texts as the basis for more recent empirical research. We have also identified some shifts that have taken place in virtue talk over the last few decades. For example, flexibility and interpersonal qualities have gained prominence in the more recent sources. We see this as consistent with the trend towards the increasingly collaborative nature of ITD research. The historical approach we used unveiled temporal patterns that we could compare with historical developments of virtue talk in disciplines, such as history, psychology, and physics. Doing so allowed us to recognize a process of consolidation that might otherwise have remained concealed. This highlights the importance not only of philosophical reflection but also of historical contextualization when studying ITD.

A number of questions arise from the current study, which we consider to prompt further exploration and reflection, and thus provide promising avenues for future philosophical research. To conclude this article, we wish to briefly highlight two of them. First, the more recent shift away from a discourse of virtues to one of competencies and practices seems to imply trainability of ITD. But to what extent can ITD actually be trained? If ITD requires a set of

virtues, to what extent are these virtues teachable?[11] And if they are not, does ITD scholarschip perhaps naturally fit some people better than others, based on their cognitive and characterological predispositions? Second, our study reveals that the historical discourse on ITD is marked by continued reflection on whether or not interdisciplinarity and objectivity are in tension. This particular issue has yet remained underexplored in the philosophy of interdisciplinarity, as well as in the philosophy of science. In conclusion, we view our study as a modest starting point for advancing these discussions within the philosophy of inter- and transdisciplinary research and education.

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[11] There is an extensive philosophical literature on whether or not virtues such as creativity and curiosity are teachable. See, for example, Baehr, 2013; Ziche, 2023.

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