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To cite this article: Mayke W. C. Vereijken, Sanne F. Akkerman, Susan F. te Pas, Iris van der Tuin & Manon Kluijtmans (2023) 'Undisciplining' higher education without losing disciplines: furthering transformative potential for students, Higher Education Research & Development, 42:7, 1762-1775, DOI: [10.1080/07294360.2022.2156482](https://doi.org/10.1080/07294360.2022.2156482)

To link to this article: <https://doi.org/10.1080/07294360.2022.2156482>



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Published online: 19 Dec 2022.



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‘Undisciplining’ higher education without losing disciplines: furthering transformative potential for students

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ABSTRACT

In universities worldwide, there has been a movement away from mono-disciplinary towards multi-, inter- and transdisciplinary education, motivated by the notion that complex societal issues call for more than a single disciplinary perspective. To prepare students for a role in addressing these issues, flexibility within educational programs is needed for students to move within, across and beyond disciplines. Contrary to the intended orientation on societal issues, multi-, inter- and transdisciplinary education appear in the current discourse regularly as aims in themselves, as if they were distinctive types of education that one should adopt at the level of a course or a program. We argue that education could more flexibly utilize and create free space: continuously questioning, also together with students, what sorts of perspectives and disciplinarity problems require. Therefore, we propose *boundary crossing* as an alternative way of thinking about multi-, inter- and transdisciplinary education. At many universities, organizing for flexibility already gains some traction. However, we believe that a shift of focus towards more open ways of transgressing disciplines in the field of higher education is vital for furthering the transformative potential of multi-, inter- and transdisciplinarity for students to being and becoming the professionals that society needs.

ARTICLE HISTORY


Received 19 January 2022
Accepted 21 November 2022

KEYWORDS

Higher education;
multidisciplinary education;
interdisciplinary education;
transdisciplinary education;
boundary crossing

Introduction

For quite some years, we see a growing interest in multi-, inter- and transdisciplinary higher education across the globe. Initiatives across disciplines at universities currently range from incidental pilots into institution-wide adaptation (Vienni Baptista & Klein, 2022). The trend towards multi-, inter- and transdisciplinary education is typically motivated by the idea that most societal issues, for example sustainability, social equality, and health promotion, require more than a single disciplinary perspective in order to be

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properly addressed (OECD, 2019). To that end, both undergraduate and graduate programs across the globe seek various ways in which teaching can be arranged to cross disciplinary boundaries and allow students to learn how to think within, across and beyond disciplinary perspectives (Marins et al., 2019). The paradoxical situation is, however, that this search for ways of crossing disciplinary boundaries risks fixating disciplines as if they were static perspectives and bodies of knowledge that can be added up or intermingled into specific educational models (cf., Weingart, 2000 for an earlier mobilization of ‘the paradox of interdisciplinarity’). Fixating disciplines makes it attractive for higher education institutes and programs to adopt and promote a particular mode of disciplinarity (i.e., mono-, multi-, inter- or transdisciplinarity). This, however, leads institutes and programs to train students to understand and solve complex issues in a habitual manner. The threat here is that higher-education institutes may do the opposite of what they often set out for students to experience at a meta-level, offering a transformative kind of education in which students are to reflect on who they are in the process of becoming and what they may contribute to society. Transformative education stimulates an openness to cooperate with others, widening one’s perspective and fostering students’ adaptivity. This aim of the ‘open mind’ should be aspired for all students, regardless of whether they opt for a mono-, multi-, inter- or transdisciplinary study program. The existing need to go beyond disciplines in education has on occasions led to formats that may permit, but in themselves do not equal the reflexivity and flexibility needed to address societal issues.

Unsurprisingly then, the domain of higher education still struggles to define and identify multi-, inter- and transdisciplinarity and what this should mean for students and teachers (e.g., Davies & Devlin, 2010; Falcus et al., 2019; Jacob, 2015; Klein, 2004; Lattuca, 2003; Park & Son, 2010; Power & Handley, 2019; Rowland, 2006). As many scholars have stressed, each mode of disciplinarity has its own particular epistemic value for science and society and for students’ future professional lives. Taken in their extreme forms, scholars have stressed the respective need for specialist, broad or adaptive expertise. For example, in multidisciplinary higher education emphasis is on ‘a combination of various disciplines as independent and separate components of learning, which allows students to work within discipline specific parameters and attain discipline specific goals’ (Park & Son, 2010, p. 83). This contrasts to what is portrayed as a typical aim of interdisciplinary education in which ‘the overall purpose [...] is to break down subject boundaries and see how different discipline areas can work together’ (Falcus et al., 2019, p. 129). It has been argued that interdisciplinary education is better suited than multidisciplinary education to prepare students for the needs of the present and future world, because in interdisciplinary subjects ‘students develop a meta-knowledge about different disciplines, methods and epistemologies, and learn how to purposefully and reflectively integrate and synthesise different perspectives in order to advance understanding and solve problems’ (Golding, 2009, p. 2). In turn, multi- and interdisciplinary education have been contrasted to transdisciplinary education which is stressed to be valuable in its openness: ‘transdisciplinary teaching must be about opening minds, reflect their understanding of and concern for the ways in which learning within disciplines can narrow students’ thinking and limit their capacity for seeing the value of working with and drawing upon disciplines outside of their own’ (McClam & Flores-Scott, 2012, p. 239). Other scholars have argued that while mono-, multi- and

interdisciplinary approaches to organizing university teaching and learning are not wrong in themselves, they fall short given the nature and complexity of the challenges facing humanity in the twenty-first century (McGregor & Volckmann, 2013). As a result, a call has been made for transdisciplinary education (e.g., Nicolescu, 2012). For example, in a recent book chapter on transdisciplinary pedagogy in higher education, McGregor (2017) states:

If higher education students are fortunate, they will experience more than disciplinary learning and be exposed to multidisciplinary learning (more than one discipline, with no integration), and interdisciplinary learning (between disciplines, with integration). All of these approaches remain confined to disciplines, excluding other ways of knowing. Transdisciplinarity pushes the boundaries of these three approaches to include both higher education (mono, multi and inter-discipline) and larger society (government, industry, citizens and civil society). TD pedagogy helps students to learn to co-create, co-disseminate and co-use transdisciplinary knowledge, which emerges from the iterative interactions between disciplines and the rest of the world. (McGregor, 2017, p. 3)

In most comparative discussions, when plotted in time, we find that interdisciplinary higher education has long been preferred over multidisciplinary education and transdisciplinary education is gradually being preferred over multi- and interdisciplinary education (Fam et al., 2018; Gibbs, 2017; McGregor & Volckmann, 2013).

At our own institution, a large research-intensive university in Western Europe, more than 40,000 students can choose from a growing set of complementary disciplinary, multi-, inter- and transdisciplinary electives, minors and programs. The affirmed need for societally relevant higher education and the debate about transformational learning has led to an increase in university-wide interest groups supporting the development of and research into inter- and transdisciplinary education, and to professionalization trajectories for better teaching across and beyond disciplines. There is also an increase in partnerships with other universities regionally and internationally aimed at broadening the portfolio of disciplines and specializations, as well as with societal stakeholders for transdisciplinary projects. These ways of defining, debating and organizing multi-, inter- and transdisciplinary education are, in fact, gaining traction at research-intensive universities globally (e.g., Global Alliance of Inter- and Transdisciplinarity, 2022).

Striking in the current discourse is that multi-, inter- and transdisciplinarity have become notable new objectives in the field of higher education. It is precisely in taking a model of disciplinarity as objective, instead of a means to the end of understanding societal issues, that we see a risk. Although we see room for some dedicated courses that might specifically focus on inter- or transdisciplinary research and collaborative methods (e.g., courses teaching the widely applicable ten-step model of Repko and Szostak (2021) as an end in itself), it is the risk of higher education courses and programs going beyond disciplines by default that these start drilling an approach rather than teaching the reflection and transformation that is aimed for – as if any one form of disciplinarity has absolute and lasting value (and another is now decisively *passé*). Another risk of such an approach is the implied suggestion of disciplines being fixed and in need of infusion with multi-, inter- and transdisciplinarity in order for dynamic flexibility to occur, whereas disciplines are dynamically flexible and ever-evolving in themselves. In this paper, we argue that the focus of the current discourse on the contribution of, and collaboration and interaction between disciplines, implies treating disciplines as

being static instead of living, evolving fields, an implication that hampers flexibility. Consequently, students and teachers are left little free space for going in whatever mono-, multi-, inter- or transdisciplinary direction an issue asks for. This is a risk that needs mitigating for higher education courses and programs to be truly transformative.

We emphasize that multi-, inter- and transdisciplinary approaches each have their own value for teaching, learning and for science and society. Therefore, we argue in this conceptual paper, based on literature review as well as on our own local, yet regionally and internationally networked, practice, that higher education courses and programs should not necessarily shift to one model of education or another, but rather must take seriously in practice what appears to be the underlying quest in seeking more disciplinary degrees of freedom: the need to engage in a reflection on what perspectives and, consequently, what individual and collaborative efforts specific societal issues call for. We propose *boundary crossing* as providing an alternative way of thinking about modes of disciplinarity in the context of teaching and learning. The boundary crossing perspective highlights that instead of trying to eliminate boundaries between disciplines (e.g., by training students in habitual multi-, inter- or transdisciplinary approaches), experiences at the boundaries between disciplines are open spaces and opportunities for identification, coordination, reflection and transformation (Akkerman & Bakker, 2011). We base our conclusions on an in-depth review of literature on the sociology of science, sociology of education and conceptual and practice-based studies of mono-, multi-, inter- and transdisciplinarity in higher education curricula. The aim of this paper is to conceptualize how higher education can engage students more flexibly in multi-, inter- and transdisciplinary education and how institutes, programs and courses may practically foster the transformative potential for students. Furthermore, we describe three occurring ways of organizing for multi-, inter- and transdisciplinary higher education including their strengths and flexible potential. In doing so, we identify the key organizational issue that the field of higher education faces in response to the need to prepare students to work on complex issues.

In this paper, we use the term ‘disciplinarity’ to describe the whole spectrum of multi-, inter- and transdisciplinary education. The quest of higher education to engage students more flexibly in and across disciplinarity leads us to raise the following questions: What is discipline as construed in higher education discourse in relation to discipline as enacted in practice? Given the discourse, organizational developments and practical examples, what free space do students have in higher education to question disciplines and their relations? And when does higher education foster transformative potential for students? With this paper, we critically reflect on the status quo of multi-, inter- and transdisciplinary higher education.

Discipline in practice and in education

We see a worrying tendency in higher education to approach multi-, inter- and transdisciplinarity as indicators of fixed relations between given knowledge domains (i.e., disciplines). Subsequently, the three disciplinarity are translated into modeled education programs in order for students to understand and apply multi-, inter- and transdisciplinarity (cf., Davies & Devlin, 2010; Fam et al., 2018; Klein, 2010; Lattuca, 2003; Nicolescu, 2012; Spelt et al., 2009). This tendency originates in monodisciplinary education. A

commonly made distinction in monodisciplinary education is between discipline as education (e.g., a subject) and discipline as research or knowledge domain (cf., Bernstein, 1999, 2000; Meyer & Land, 2005). Along this logic of monodisciplinary education, discipline as knowledge domain is recontextualized, translated and summarized into bodies of most important knowledge to be taught, learned and evaluated (cf., recontextualization rules, Bernstein, 2000; Shay, 2016). Translation of a discipline into education can result in transformed ways of understanding and interpreting a discipline, through student engagement with subjects and embedded disciplinary standards over time (e.g., Ashwin et al., 2014; Barnett, 2009; Meyer & Land, 2005). Yet translating or recontextualizing relations between disciplines as knowledge domain into fixed educational models cannot fully account for real, ever-evolving disciplines.

Disciplines are rather amorphous, transitory entities which transform over time and guide what professionals do (Abbott, 2001; Brew, 2008; Collins, 1998; Tight, 2014; Trowler et al., 2012). Akkerman et al. (2021) take this even further, arguing that disciplines look forward along with society, care for the future set out for people by what they put in the world – albeit that these inputs (and the disciplines that have constructed them) can develop in unforeseeable ways. They stress how studying or striving to achieve a certain end point (e.g., as in finding out how to generate solar power) does not mean control; already while engaging or studying a topic disciplines face and themselves create new conditions and ambitions (e.g., earlier development of solar power leads to new questions such as storing energy in new ways). Disciplines are set in place to ascertain what counts as knowledge and as accepted ways of knowledge development, bound together by affinity, necessity and historical coincidence (Knorr Cetina, 1999). Each discipline is continuously responsive to new (im)possibilities that come up in, between and around it. This makes disciplines more than fixed knowledge domains in heads and habits of academics that can be translated into education. Disciplines have purpose and are constantly evolving, in other words, disciplines are alive (Akkerman et al., 2021).

As in the solar power example, it might take knowledge or skills outside the original discipline to pursue new ambitions. This does not necessarily lead an existing discipline to die out or to fall apart. Collaborations between scientists happen through material and conceptual tools which embody what is not yet known (Knorr Cetina, 1999; Nicolini et al., 2012). These tools are open-ended and work as a source of motivation, a pattern of wanting that keeps disciplines together and shape research practices (e.g., solar power cells; Knorr Cetina, 1999; Nicolini et al., 2012). So, searching for solutions to societal issues can lead to multi-, inter- or transdisciplinary collaboration, or to incorporating new knowledge structures into an existing discipline. Disciplines and collaborations between disciplines are held together as long as there is relevance to do so. Relevance can also inform how collaborations take form (e.g., division of tasks among separate disciplines, exchange between disciplines, or emergence of new disciplines).

Since disciplines are alive, so is the relation between disciplines which is constantly shaped and negotiated. This aliveness is in danger of getting lost in higher education when courses and programs treat disciplines and their relations as relatively static and therefore as hampering engagement with and response to dynamic and ongoing societal issues. We conclude that higher education is in need of an alternative approach which acknowledges the dynamic and responsive nature of disciplines. As long as the form of disciplinarity is not leading, higher education can help students to reflect on their

discipline as well as on disciplinarity and the dynamic nature of both. Furthermore, there is a vital relation between disciplines and disciplinarity: there simply are no disciplinarity without disciplines, and any meaningful relationality and collaboration across disciplines stands by having valuable (i.e., complementary, nested, challenging) differences and diversity of disciplinary perspectives (Akkerman et al., 2012). A first step in considering discipline in education as dynamic and responsive would be to take a more critical stance towards the desire to predetermine learning which is a desire that all too often drives higher education (cf., Akkerman et al., 2021; Ashwin, 2020; Biesta, 2014; Dall’Alba & Barnacle, 2007).

Permeability of disciplinary boundaries in education

The recontextualisation logic of translating relations between disciplines into relations between disciplines in education is evident in taxonomies of multi-, inter- and transdisciplinary education (e.g., Davies & Devlin, 2010; Fam et al., 2018; Klein, 2010; Lattuca, 2003; Nicolescu, 2012; Repko & Szostak, 2021; Spelt et al., 2009). These taxonomies do not include the more fundamental question of the need for collaboration within, between and beyond disciplines (cf., Scott, 2017 in Gibbs, 2017, p. 39). This may hinder student learning, because pinpointing what each disciplinarity entails and teaching students accordingly makes it tempting to cram a multitude of disciplinary perspectives into curricula placed either in succession or side by side (in blocked practices). Consequently, higher education may overwhelm students with multiplicity. Alternatively, a higher education curriculum could help students experience disciplines as coordinating work in shared problem spaces, where collaboration emerges out of need and relevance (Akkerman & Bakker, 2011). This requires organizational flexibility, as disciplines need each other in a multi-, inter- or transdisciplinary manner depending on the issue at hand. Higher education, par excellence, can be the space to question the relevance of mono-, multi-, inter- and transdisciplinarity to complex problems and to foster awareness, in both teachers and in students, of a disciplinary perspective as being only one of many and as evolving.

The question then is how a shared problem space between disciplines in education can be created. In line with Young and Muller (2010), we believe that seeing boundaries between disciplines in curricula only as socially constructed entities between knowledge domains that can be taken away – if only people would want to – overemphasizes generic student outcomes and undermines the transformative potential of the educational process for students. The intrinsic richness of learning experiences across boundaries of disciplines can get lost when disciplinarity are treated mechanistically. Therefore, higher education should acknowledge the boundaries between knowledge domains raised by historical and real conditions under which knowledge is produced and approach those boundaries as permeable as well as flexible membranes like collaborating academics in a shared problem space do (Akkerman et al., 2012; Ash, 2019; Barrett, 2012; Graff, 2016; Young & Muller, 2010). Hence, we propose to approach multi-, inter- and transdisciplinary education as a matter of crossing boundaries between disciplines in non-prescribed manners as different modes of disciplinarity are required for different societal and scientific issues.

Boundary crossing occurs in between two or more worlds (e.g., disciplines), when a shared problem space at the boundary belongs to *both* one and *another* world (i.e., discipline) and the shared problem space also reflects a nobody's land (Akkerman & Bakker, 2011). People at the boundary have the task to bridge both worlds, but also are held accountable in each world, which will result in disciplines to be questioned and developed instead of being passively received by students (Akkerman & Bakker, 2011). Therefore, according to boundary crossing theory, boundaries carry learning potential for individuals, groups and organizations (e.g., disciplines) (Akkerman & Bakker, 2011). At boundaries, the following four learning mechanisms can take place depending on the disciplinary approach students take (cf., Akkerman & Bakker, 2011):

- (1) *Identification*: Students gain (new) insight into their own disciplinary perspective on the issue at hand and the way in which other discipline(s) approach this issue (i.e., othering).
- (2) *Reflection*: Students see their own discipline through the eyes of another discipline, which leads to new insights (i.e., perspective taking; cf., Repko & Szostak, 2021, pp. 16–18).
- (3) *Coordination*: Students' use of or search for procedures and means to collaborate between disciplines.
- (4) *Transformation*: Students develop new ways of doing and thinking which have characteristics of one discipline and other(s) (i.e., a hybrid position), which are partially integrated into their professional identity in the making (cf., Akkerman & Bakker, 2011; Gulikers & Oonk, 2019).

We want to emphasize that what is to be learned at boundaries between disciplines does not necessarily exist yet. That is precisely the nature of the fourth learning mechanism, that of transformation. Not accounting for living, ever-evolving disciplines in education leads to teaching students a top-down curriculum version of discipline and disciplinarity. This is opposite to the pressing need for understanding present and future societal issues which are as yet partially unknown. Seeing discipline and disciplinarity in education as a toolbox for future knowledge is and remains important, but neither disciplines nor disciplinarity nor toolboxes suffice. This also means that specialization is rather one of the outcomes of moving between disciplines (i.e., identification) instead of a prerequisite that should be in students' heads and habits before they bridge boundaries. If a particular complex issue requires specialization and students are held accountable for the approach (i.e., mono-, multi-, inter- or transdisciplinary) they take to understand the issue this will facilitate their investigation into the unknowns. Predetermining what type of disciplinarity should be the focus of teaching and learning leads to disciplining students in the other sense of the word: training them to do something in a controlled and habitual (i.e., multi-, inter- or transdisciplinary) manner. Instead, higher education could search for shared problem spaces around disciplines as a way to involve students in their own learning, to foster students' willingness to collaborate and to promote adaptivity. An implication for assessment is then that education ought to value students' questioning of disciplinarity. For example, through means that provide insight into the learning process.

Students as active agents using a free space

Approaching discipline and disciplinarity as static treats students as passive receivers of knowledge rather than as active agents, who can take a central position in their own learning and identity development. Being a student is a period of potential formation and transformation: recognizing new possibilities, adapting provisional identities, making mistakes and, thus, learning. Identity development involves students being agentic, continuously interpreting and responding to opportunities and demands, in order to leave the university as a different person in some way (cf., Ashwin, 2020; Biesta, 2014; Edwards, 2017). The direction of students' individual development in this sense cannot be determined upfront; identity is no matter of cultivating students in a controlled, mechanistic way into a certain direction (Biesta, 2014; Van der Veen & van Oers, 2019). Students are mature individuals with the ability to act (or not) and therein explore mono-, multi-, inter- or transdisciplinary directions. Important is that students need time and space to work on issues and ponder what particular issues require from them and whom they want to be or become – what to *do* with their provisional identity. The challenge for every student is to deal with this freedom responsibly (i.e., subjectification; Biesta, 2014). In the current debate on disciplinarity it is easy to lose sight of subjectification (for a counter case using 'self-authorship' (see Van der Lecq, 2016).

We think higher education curricula have the potential in both theory and in practice to create or utilize free space for students, for subjectification. By engaging students in decisions on whether their education (i.e., program, course or specific assignment) should be mono-, multi-, inter- or transdisciplinary, education can promote student agency so that they can work on what is at stake (e.g., Bovill et al., 2016). This enables higher education to educate students who are able to position themselves in the world as independent and responsible academically trained professionals, who can reflect on living disciplines and who, consequentially, can take or make another perspective on societal issues by contributing to or employing the disciplinary field(s) they identify with. Engaging students in decisions is contrary to the tendency of looking for highly detailed learning outcomes and skills-based preparation for the workforce that is said to be present in current-day higher education (Ashwin, 2020). By building capacity in local and regional teacher professionalization trajectories, in the aforementioned Global Alliance of Inter- and Transdisciplinarity (2022) and through the practice-based literature that we draw on in this paper, we already see educational policies allowing for courses and programs to flexibly provide students with greater degrees of freedom, and teachers and students shifting towards engaging in discussion, questioning why certain mono- and multidisciplinary learning outcomes are desired, to what extent these can be predetermined and what disciplinary support students need. For instance, the disciplinary support needed for students will depend on differences between disciplines (e.g., context-dependent vs. systematically principled disciplines; cf., Bernstein, 1999).

An organizational issue facing higher education

We contend that higher education should 'undiscipline' disciplinarity in the sense that education should not train students to blindly follow formats. Thus, doing something in a

controlled and mechanistic mono-, multi-, inter- or transdisciplinary manner must be unlearned or discouraged. Undisciplining disciplinarity in higher education requires flexible ways of organizing. That is, ways of organizing that allow for continuous responsiveness to new (im)possibilities that occur within, between and beyond disciplines for understanding of complex issues. Higher education faces the challenge of how to organize and structure education that adequately responds to issues of today and tomorrow which require, depending on the problem, very specific, multi-, inter- or transdisciplinary knowledge within large academic institutions structured by scientific disciplines (the so-called disciplinary 'silos', see Lindvig et al., 2019). In educational practice steps are already being taken in this regard (see, e.g., Cai & Lönnqvist, 2021; Vienni Baptista & Klein, 2022). In what follows, we describe some common ways in which disciplinarity is currently organized in higher education. We then reflect on these ways of organizing in the light of the implications of our conceptual discussion and raise three questions we think higher education should address in order to support students in being and becoming the professionals that society needs in the present and for the future.

The three ways of organizing disciplinarity described here can very well and usually do occur side by side. First, a growing set of universities aims to foster student choice by allowing or stimulating flexibility in student journeys (see, e.g., Mcdossi, 2021). According to this way of organizing, students take courses within and outside disciplinary educational programs (e.g., electives, minors). This requires students to exercise agency and to cross boundaries between different disciplines and with their own discipline. Depending on the educational program and the local implementation of this type of flexibility students are more or less self-directing in creating opportunities to take part in more than one epistemic culture – either one after the other or simultaneously. This format raises the question of how higher education may stimulate going beyond one's discipline and how to support students' learning beyond the single discipline(s); for example, through personal academic tutoring aiming to help students making choices based on the question of what kind of professional they aspire to be and encouraging them to reflect on what they have learned from their elective program elements. In previous years, tutoring has mainly been considered as something happening in disciplinary silos (Davis et al., 2015; Dodson et al., 2009). Next to tutoring, also 'boundary objects' having their own significance in both or more of the disciplines involved (e.g., theoretical models, methods or procedures) can help students and teachers crossing boundaries between disciplines (Akkerman & Bakker, 2011). This raises the question of what enables tutors, teachers and students to transition between disciplines and what hinders, how these transitions can be supported by the university's curricular policies and procedures, as well as its teacher professionalization program within and across disciplines and what the transitions mean for being and becoming an academic and a future professional.

Second, educational innovation at universities increasingly moves toward creating multi-, inter- and transdisciplinary modules as part of the regular curriculum or as optional yet for-credit activities (e.g., Vienni Baptista & Klein, 2022). Although the ability of students to navigate between disciplines may be the intention of these modules, developing such modules and meaningful connections between them places greater pressure on disciplinary education and is potentially fragile (Hannon et al., 2018). A reason for this is that a modular organization depends heavily upon lecturers

who are able or supported to create shared problem spaces (e.g., Edwards et al., 2020). Previous studies into interdisciplinary teacher collaborations reveal both challenges and successes of modular organization. Teachers experience personal satisfaction and professional growth and for the organization these collaborations provided an opportunity to model collaborative learning for students at relatively low costs (Pharo et al., 2012). At the same time, Hannon et al. (2018) identified stable curriculum teams as key for managing tensions between disciplinary silos. Still, stable curriculum teams are only one answer to the question of how collaboration processes and artifacts (e.g., vignettes, assessment tasks, learning activities and real-world problems) can be coordinated and sustained across disciplines in higher education. This raises the question of how teachers in multi-, inter- and transdisciplinary courses divide teaching based on their expertise and how they collaboratively create sustainable new modules.

Third, universities increasingly offer students fully inter- and transdisciplinary educational programs (cf., Knight et al., 2013). This allows for greater synthesis between disciplines in education, but also creates a cut-off space that only a certain group of students participates in, namely, those students who explicitly develop and pursue interests in programs across multiple disciplines rather than within a discipline (Vulperhorst, 2022, pp. 103–104). From our point of view, the question in such cut-off spaces is how teachers and students can create room to move into mono- or multidisciplinary directions that are valuable in light of a specific theme or issue at hand. Recently, co-creation has emerged as a way of organizing inter- and transdisciplinary programs (e.g., Baumber et al., 2020; Björklund et al., 2019). In co-creation of the curriculum, students are asked for help to refine the structure of subjects they or others will be undertaking in the future, although it seems challenging to create trust and reciprocity between students and teachers (Baumber et al., 2020; Bovill & Woolmer, 2019). In addition, in continuing education cut-off spaces including only certain groups of professionals already seem to dissolve (Wallin et al., 2019). Also, in complex innovation processes disciplines and society already interact in greater freedom with one another, for example, through ‘knotworking’ (Kerosuo, 2018). Continuing education and innovation practices can serve as a source of inspiration for how to open up a cut-off space.

Conclusion

Higher education intends to create learning conditions for students to transform the way they see themselves, society, and how they can contribute to today’s and tomorrow’s complex societal issues. Both crossing boundaries between disciplines is essential for many such issues, as well as for fostering students’ reflection on what disciplines entail. Boundaries between disciplines carry learning potential for students, albeit the approach to disciplinarity and the learning outcomes cannot be predetermined as mono-, multi-, inter- and transdisciplinarity and should depend on the issue at stake. In addition, students should not be taught relationships between disciplines as if they were fixed: academic education should introduce them into actual, ever-evolving disciplines. Furthermore, students are individuals who can decide to act (or not) upon issues at stake and what choices to make in their education. A boundary crossing perspective reveals learning at boundaries that may happen in (un)expected directions allowing for new discoveries, for students as well as teachers. In order to organize


education to fruitfully use boundary learning potential, higher education could further utilize the shared problem spaces in which disciplines co-exist and collaborate and more strongly involve students in choosing the direction(s) that problems require. Current and new electives, minors and programs that already cater for that, provide a source of inspiration.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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