



Joint Public Policy Report on Transdisciplinary Science and Education

ABOUT THE PUBLISHER

© ENHANCE – European Universities of Technology Alliance

This document is available on the internet in summary with option to download the full text at www.enhanceuniversity.eu

Drafted in May 2023

AUTHORS

Dr. Thorsten Philipp
Ignacio Yusim,
Kristina Henricson Briggs
Mikael Enelund

DISCLAIMER

This document is a draft working paper of Working Group 4.2. Transdisciplinary Education within the European university network ENHANCE (2023). This policy paper is intended to be used by people who occupy positions of political responsibility at different levels. Any use, reproduction or republication of this text in full, part, or extracts, is prohibited. To ask an authorization of further usage, please contact Thorsten Philipp (TU Berlin) at thorsten.philipp@tu-berlin.de.

CONTENTS

ABSTRACT	4
Translation of the abstract in German, Italian, Norwegian, Polish, Swedish, and Spanish.....	4
1. THE RELEVANCE OF TRANSDISCIPLINARY EDUCATION	7
2. INSTITUTIONALISATION OF TRANSDISCIPLINARY EDUCATION	8
3. FUNDING AND REMUNERATION	9
4. VOCATIONAL TRAINING	9
5. CONCLUSIONS	10
6. REFERENCES.....	11



ABSTRACT

Today's global challenges urge for an understanding of academic education, in which scientific knowledge alongside other knowledge resources such as experience-based knowledge, professional knowledge, embodied knowledge, arts-based knowledge translation, etc., cooperatively contribute to problem solving. However, the institutionalization of transdisciplinary education at universities requires new structures in administration and university management, methodological competence, and a change management at strategical levels. The reform path toward a participative culture in teaching and learning comprises strengthened efforts in incentive structures, funding lines, recognition culture, and resource allocation. It is no longer acceptable that transdisciplinary learning depends solely on the commitment of individual lecturers. University administrations and decision-makers must actively provide supportive framework conditions to promote the overdue systemic change and make students be part of the creative interplay between science and society.

TRANSLATION OF ABSTRACT

GERMAN: Zusammenfassung

Die globalen Herausforderungen von heute erfordern ein kooperatives Verständnis von akademischer Bildung, in dem wissenschaftliches Wissen neben anderen Wissensressourcen wie Erfahrungswissen, Berufswissen, Körperwissen, künstlerisch erarbeiteten Wissen etc. zur Problemlösung beiträgt. Die Institutionalisierung transdisziplinärer Bildung an Hochschulen erfordert jedoch neue Strukturen in Verwaltung und Hochschulmanagement, Methodenkompetenz und umsichtiges Change Management auf strategischer Ebene. Der Reformweg hin zu einer partizipativen Lehr- und Lernkultur umfasst verstärkte Anstrengungen bei Anreizstrukturen, Förderlinien, Anerkennungskultur und Ressourcenverteilung. Transdisziplinäres Lernen darf nicht weiterhin allein vom Engagement einzelner Dozent*innen abhängen. Hochschulleitungen und Entscheidungsträger*innen müssen aktiv unterstützende Rahmenbedingungen schaffen, um den überfälligen Systemwechsel zu fördern und Studierende in das kreative Zusammenspiel von Wissenschaft und Gesellschaft einzubinden.

ITALIAN: Astratto

e sfide globali di oggi richiedono una concezione dell'istruzione accademica in cui la conoscenza scientifica, insieme ad altre risorse di conoscenza come quella basata sull'esperienza, la conoscenza professionale, la conoscenza incarnata, la conoscenza mutuata dall'arte, ecc. contribuiscono in modo cooperativo alla soluzione dei problemi. Tuttavia, l'istituzionalizzazione dell'educazione transdisciplinare nelle università richiede nuove strutture nell'amministrazione e nella gestione universitaria, competenze metodologiche e una gestione del cambiamento a livelli strategici.

Il percorso di riforma verso una cultura partecipativa nell'insegnamento e nell'apprendimento comprende maggiori sforzi a livello di incentivi, linee di finanziamento, riconoscimento e allocazione delle risorse. Non è più accettabile che l'apprendimento transdisciplinare dipenda solo dall'impegno dei singoli docenti. Le amministrazioni universitarie e i decision makers devono creare attivamente le condizioni per promuovere il cambiamento sistemico e far sì che gli studenti siano parte dell'interazione creativa tra scienza e società.

NORWEGIAN: Sammendrag

Dagens globale utfordringer krever en forståelse av akademisk utdanning der vitenskapelig kunnskap i tillegg til andre kunnskapsressurser som erfaringsbasert kunnskap, profesjonell kunnskap, internalisert kunnskap, kunstbasert kunnskap osv. bidrar til problemløsning. Institusjonalisering av tverrfaglig utdanning ved universitetene krever imidlertid nye strukturer i administrasjonen og universitetsledelsen, metodologisk kompetanse og endringsledelse på strategisk nivå. Veien mot en reform i retning av en deltakende kultur i undervisning og læring innebærer forsterket innsats i insentivstrukturer, finansieringsmodeller, anerkjennelseskultur og ressursallokering. Det er ikke lenger akseptabelt at transdisiplinær læring bare avhenger av engasjementet til individuelle forelesere. Universitetsadministrasjoner og beslutningstakere må aktivt sørge for støttende rammebetingelser for å fremme denne systemendringen og gjøre studentene til en del av det kreative samspillet mellom vitenskap og samfunn.

POLISH: Streszczenie

Dzisiejsze globalne wyzwania wymagają adekwatnej reakcji ze strony kształcenia akademickiego, w którym wiedza naukowa łączy się z innymi zasobami wiedzy, takimi jak wiedza oparta na doświadczeniu, wiedza zawodowa, wiedza oparta na poznaniu reakcji własnego ciała, wiedza bazująca na sztuce itp. i przyczynia się do rozwiązywania problemów. Instytucjonalizacja kształcenia transdyscyplinarnego na uczelniach wymaga nowych struktur w administracji i zarządzaniu uczelnią, kompetencji metodycznych oraz zarządzania zmianą na poziomie strategicznym. Ścieżka reform w kierunku kultury partycypacyjnej w nauczaniu i uczeniu się obejmuje wzmocnienie wysiłków w zakresie budowania systemów motywacyjnych, modeli finansowania, kultury organizacyjnej i alokacji zasobów. Nie można już akceptować

sytuacji, w której kształcenie transdyscyplinarne zależy wyłącznie od zaangażowania pojedynczych nauczycieli akademickich. Administracje uczelni i osoby podejmujące decyzje muszą zapewnić aktywne wsparcie, aby promować adekwatną, znacznie już opóźnioną zmianę systemową i sprawić, by studenci stali się elementem twórczej interakcji między nauką i społeczeństwem.

SWEDISH: Sammanfattning

Dagens globala utmaningar kräver förståelse för att den akademiska utbildningen behöver inkludera vetenskaplig kunskap tillsammans med andra kunskapsresurser, t.ex. erfarenhetsbaserad kunskap, yrkeskunskap, praktisk kunskap och konstbaserad kunskapsöverföring, som bidrar till att lösa problem tillsammans. Institutionaliseringsen av tvärvetenskaplig utbildning vid universiteten kräver dock nya strukturer inom administration och universitetsledning, metodologisk kompetens och en förändringsledning på strategisk nivå. Vägen mot en reformering till en deltagande kultur i undervisning och lärande inkluderar förstärkta insatser i fråga om incitamentsstrukturer, finansieringsvägar, erkännandekultur och resursfördelning. Det är inte längre tillräckligt att tvärvetenskapligt lärande enbart beror på enskilda föreläsares engagemang. Universitetsledning och andra beslutsfattare måste aktivt tillhandahålla stödjande ramverk för att främja nödvändig systemförändring och för att få studenterna att bli en del av det kreativa samspelet mellan vetenskap och samhälle.

SPANISH: Resumen

Los retos globales actuales exigen una concepción de la educación académica en la que el conocimiento científico, junto con otros recursos de conocimiento como el conocimiento basado en la experiencia, en la profesión, en las destrezas que se adquieren por acciones repetitivas, y los procesos de interpretación artística, etc., contribuyen, en igualdad de condiciones, en la resolución de problemas. La institucionalización de la educación transdisciplinar en las universidades requiere nuevas estructuras en la gestión universitaria, nuevas competencias metodológica y una gestión del cambio a nivel estratégico. Hablar de cultura participativa en la enseñanza y el aprendizaje pasa por aumentar los esfuerzos en las estructuras de incentivos, las líneas de financiación, la cultura del reconocimiento y la asignación de recursos. Ya no es aceptable que el aprendizaje transdisciplinar dependa únicamente del compromiso individual de los profesores. Las administraciones universitarias y los responsables de la toma de decisiones deben proporcionar activamente unas condiciones favorables para promover el cambio sistémico pendiente y hacer que los estudiantes formen parte de la interacción creativa entre ciencia y sociedad.

1. THE RELEVANCE OF TRANSDISCIPLINARY EDUCATION

In times of global challenges, universities are not only agents of societal change, but also spaces to reflect and negotiate responsibility. Global megatrends and developments such as environmental degradation, more effective and equal use of land, energy and other resources, migration movements, and urbanization affect both scientific research and academic teaching. They urge universities to expand their understanding of science and to integrate expertise from societal actors into the process of knowledge production. The term *transdisciplinarity*, coined in the 1970ies (Apostel et al. 1972) and further developed in the context of science and technology studies, describes the idea to establish strategic research and learning alliances between university and society to enhance learning experiences: faculty staff members and students work together with experts and practitioners from politics, culture, industry and civil society to develop sustainable technologies and solutions to today's world problems (Vilsmaier et al. 2023).

In addition to scientific expertise, resources such as professional knowledge, experience-based knowledge, embodied knowledge, creative knowledge, and indigenous knowledge become self-evident elements of research projects, training, learning practice, curricula, and educational biographies. Due to the plurality of resources involved, transdisciplinary education provides students with the framework to distinguish between knowledge-based resources, consider their use for specific issues, and find ways to integrate these knowledge resources into their learning journey. In such learning experiments, students reflect their responsibility within society and share their learnings with society.

Transdisciplinary education attempts comprise (partially) established methods such as, e.g. service learning, citizen science, project-oriented learning and student-organized teaching. They can also be extended beyond these forms and include co-operation with real-life labs or living labs (Leminem et al. 2019), maker spaces, fablabs, and DIY movements (Blikstein 2013). They further encompass innovative exercises in science communication (Arber 1999), case studies (Gerring 2004), and participatory action research (Fals Borda 1987). Thus, transdisciplinary learning is not a set of clearly defined methods, but a broad range of research and education practices to cultivate the cooperation and mutual learning at the crossroads of university and societal actors.

A lively debate on transdisciplinarity during the last years (Jahn et al. 2019) has resulted in occasional policy papers (e.g. Wissenschaftsrat 2015 for Germany), which argue for a stronger institutionalization of multidirectional knowledge exchange. Nonetheless, the current situation in European universities is far from being satisfactory. Therefore, this policy paper makes the case for a stronger practice of transdisciplinary learning in universities and increased efforts for its long-term institutionalization.

The following recommendations are based on the multi-stage consultations of the working group *Transdisciplinary Education* within the ENHANCE alliance of European Universities of Technology. In particular, it takes into account the experience gained from the *Toolkit*

Transdisciplinary Education, which was developed within this framework and published in summer 2022.

2. INSTITUTIONALISATION OF TRANSDISCIPLINARY EDUCATION

The European Education Area foresees increased student mobility, and European University Alliances are called upon to ensure at least 50% of students can benefit from seamless mobility opportunities (physical, virtual, or blended)¹. The path towards this mobility target calls on universities to address a number of obstacles, including the availability of financial support for students, access to student services, and new questions posed by the increase in virtual and other flexible mobility offers.

The drive for increased mobility in higher education contributes to the internationalisation of higher education and research, to the recruitment of excellent academics at all career levels, and to the promotion of foreign language skills and the development of intercultural and personal competences among graduates. The transformative approach of European University Alliances offers a foundation for increased mobility without a corresponding increase in administrative burden.

Short-term physical mobility and virtual mobility offers both give international mobility opportunities to students seeking more accessible, flexible mobility models, and can support universities with the development of more innovative, digital teaching methods. Virtual mobility in addition can contribute to institutional climate goals. The pandemic has encouraged a rapid acceleration of more flexible mobility offers in many countries, but many new disruptive models do not fit comfortably into the established structures, which, beyond traditional Erasmus+ KA1 mobility, are largely restricted to short-term virtual mobility, micro-credentials or more recently, BIPs (Blended Intensive Programmes). The development of new models has therefore brought new administrative challenges and highlighted the limitations of the current structures.

If we are to enable students to take full advantage of the opportunities presented by increasingly flexible mobility offers then universities, national legislators, and European policymakers all have a role to play in addressing the barriers to effective implementation of these diverse mobility models.

3. FUNDING AND REMUNERATION

To improve learning practices at the interface between university and society, the access to funding opportunities is crucial: When promotional institutions (e.g., the Deutsche Forschungsgemeinschaft as an example for Germany) lack adequate funding opportunities for transdisciplinary research, it results in a deficit of transdisciplinary education. Regularly, transdisciplinary projects are designed as iterative processes that have to be developed during the course of research.

Due to their need for coordination with plural actors, transdisciplinary projects require increased staff and time resources. A central challenge of transdisciplinary work is the knowledge integration: it requires specific expertise that goes far beyond coordination work (Grunwald et al. 2020). There are examples of transdisciplinary initiatives encouraging development of teaching pedagogy and design including involving a number of external actors (Enelund and Henricson Briggs 2020). However, the duration of many externally funded programs is often too short for transdisciplinary processes to identify common research questions, develop adequate teaching designs, and conduct participatory research. In addition, the plurality and diversity of partners in transdisciplinary projects are often only involved on an honorary basis.

4. VOCATIONAL TRAINING

Another aspect of promoting transdisciplinary education concerns the expertise of researchers, teachers and university staff in general. Transdisciplinary work requires university members to communicate with practice partners and to engage in knowledge integration. These activities require a sound feedback literacy from teachers and students (Schluer et al. 2023). A new definition and understanding of the profession is needed. The definition should include the development of transformation knowledge, and the ability to moderate plural knowledge co-producers and should be part of all university members' portfolio. In addition, the capability to cultivate a broad actor network and to guarantee sound project management, combined with a positive culture of discussion should be standard in all universities' lifelong learning programs. In fact, transdisciplinary practice requires a pluralism of professional lecturer biographies.

The growing acceptance, however, does not necessarily guarantee the quality of transdisciplinary education. Multidirectional, circular or recursive transfer activities do not only aim at increasing the knowledge of civil society, enterprises, etc., but rather to actively integrate societal knowledge in the education system. Often, knowledge transfer is understood in a one-sided and unidirectional way; comparable structures for transfer to society are lacking (Maassen et al. 2019). This shortcoming complicates the institutionalization of transdisciplinarity in science, as recursive transfer requires stable, structurally supported partners as a basis. Institutionalization of transdisciplinarity within the science system needs its counterpart in all relevant parts of society.

Teaching often suffers from a lack of support structures, an overarching strategy, as it often depends solely on the profile and commitment of individual lecturers. Although, the situation changes slowly (e.g. in German universities within the Excellence Strategy funding lines), this growing acceptance does not necessarily guarantee the quality of transdisciplinary education: If transdisciplinary education and didactic transfer activities only consist of public lecture series, panel discussions, and public relations, no progress is done for the integrity of education.

5. CONCLUSIONS

The overview shows that the institutionalization of transdisciplinary education at universities must be actively pursued. It requires new structures in administration and university management, methodological competence, and a considerate change management at strategical levels. It is no longer acceptable that transdisciplinary learning depends solely on the commitment of individual lecturers. University administrations and decision-makers must actively provide supportive framework conditions to promote the overdue systemic change and make students be part of the creative interplay between science and society.

Transdisciplinary education exposes the complexity of knowledge transmission. The question is: How can universities measure or evaluate the participation of actors in transdisciplinary education projects in politics, culture, civil society, and economy? How can they give them back? Therefore, establishing indicators such as necessary training, social responsibility and creating an environment sensitive to sustainable development problems is essential to start a reflection on transdisciplinarity and its potentials (Oderhwa et al. 2021). All the above must be taken into account to broadly discuss transdisciplinarity its relevance and the need to be considered adequately nowadays.

The university, as a network of knowledge nodes, represents a structure of cooperation and communication. Teaching and university extension is linked, due to the academic activity itself, in a line of work that includes research, new technologies, and human resources of the universities themselves, transversally transferring the disciplinary variables, highlighting the connection between teaching, social service, and professional practice. The interconnection demonstrates universities' new role when linking disciplinary knowledge inside and outside the classroom. Transdisciplinarity turns out to be a true alternative to the excessive intrinsic individual behavior to which some areas, organisms and institutes of universities are subjected. The university, as a space designed for the acquisition of knowledge, should have as its primary objective to investigate the social variable of its components in order to develop innovative ideas to today's major problems.

REFERENCES

- Ahrend, Christine, and Audrey Podann. 2021. Institutionalisation. In *Handbuch Transdisziplinäre Didaktik*, eds. Tobias Schmohl and Thorsten Philipp, 141–50. Bielefeld: transcript.
- Arber, Werner. 1999. Transdisciplinarity in science education and in science communication. In *Thirteenth labor*, eds. Eric Chaisson and Tae-Chang Kim, 15–22. Amsterdam: Gordon and Breach.
- Blikstein, Paulo. 2013. Digital Fabrication and 'Making' in Education: The Democratization of Invention. In *FabLab: Of Machines, Makers and Inventors*, ed. Julia Walter-Herrmann and Corinne Büching. 203–22. Bielefeld: transcript.
- Enelund, Michael, and Kristina Henricson Briggs. 2020. Tracks for Change, Flexibility, Interdisciplinarity and Creativity in Engineering Education. *Proceedings of the 16th International CDIO Conference*, Available from <http://www.cdio.org/knowledge-library/documents/tracks-change-flexibility-interdisciplinarity-and-creativity-engineering>.
- Fals Borda, Orlando. 1987. The application of participatory action-research in Latin America. *International sociology* 2 (4): 329–47.
- Gerring, John. 2004. What is a case study and what is it good for? *American Political Science Review* 98 (2): 341–54.
- Jahn, Thomas, Florian Keil, and Oskar Marg. 2019. Transdisziplinarität: zwischen Praxis und Theorie. Reaktion auf fünf Beiträge in GAIA zur Theorie transdisziplinärer Forschung. *GAIA* 28(1): 16–20.
- Leminen, Seppo, and Mika Westerlund. 2019. Living labs: From scattered initiatives to a global movement. *Creativity and Innovation Management* 28 (2): 250–64.
- Maassen, Peter, Zacharias Andreadakis, Magnus Gulbrandsen, and Bjørn Stensaker. 2019. The Place of Universities in Society. Available from https://koerberstiftung.de/site/assets/files/19183/guc-studie_langfassung_the_place_of_universities_in_society-1.pdf.
- Oderhwa, Etienne Mulume and Sorzano Rodríguez, Deisy Milena. 2021. The transdisciplinarity in the university education. *Revista Conjeturas Sociológicas*, 1-22. Universidad Autónoma de Baja California, México.
- Philipp, Thorsten, and Tobias Schmohl, eds. 2023. *Handbook Transdisciplinary Learning*. Bielefeld: transcript (in press). Available from <https://www.transcript-verlag.de/978-3-8376-6347-1>.

Schluer, Jennifer, Olivia Rütli-Joy, and Valentin Unger. 2023. Feedback Literacy. In Handbook Transdisciplinary Learning, eds. Thorsten Philipp and Tobias Schmohl. Bielefeld: transcript (in press).

Strohschneider, Peter. 2014. Zur Politik der Transformativen Wissenschaft. In Die Verfassung des Politischen, ed. André Brodocz, Bietrich Herrmann, Rainer Schmidt, Daniel Schulz and Julia Schulze Wessel, 175-92. Wiesbaden: Springer.

University of Chile, ed. 2021. Synthesis document "Transdiscipline: Discussions for a policy of institutionalisation at the University of Chile". Santiago, Chile.

Vilsmaier, Ulli, Julia Merçon, and Esther Meyer. 2023. Transdisciplinarity. In Handbook Transdisciplinary Learning, eds. Thorsten Philipp and Tobias Schmohl, 381-90. Bielefeld: transcript (in press).

Wissenschaftsrat, ed. 2020. Anwendungsorientierung in der Forschung. Positionspapier. Köln: Wissenschaftsrat.

