



Promoting transdisciplinary teaching and learning and research in a world that is faced with multifaceted challenges

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ABSTRACT

With a lot of transformation in higher education, teaching, and learning is becoming very complex. To cope with the transformation that is so complex, academics must be innovative in their teaching. Their teaching should also influence the behaviour of their students. Students after completion of their studies must also be able to solve the challenges of society. There are several approaches to teaching and learning such as multidisciplinary, interdisciplinary, and ideally transdisciplinary, scholarship of teaching and learning, evidence-based teaching and learning, transdisciplinary teaching and learning and competence-based teaching and learning, and deep learning approaches among others. This paper focuses on the transdisciplinary research and teaching and learning approach. The aim of the paper is to investigate the importance of transdisciplinary research, teaching, and learning in a world that is faced with multifaceted challenges. This is a qualitative design paper where systemic desktop research was used. The systematic reviews follow structured and predefined methods to identify, appraise, and synthesise the relevant literature. Desktop research is a research method that involves the use of existing data. These are secondary collected and summarised data to increase the overall effectiveness of the investigation. Secondary research is much more cost-effective than primary research, as it uses existing data, unlike primary empirical research. The secondary literature was collected based on the history, challenges, and benefits of transdisciplinary research, teaching, and learning. The research study concludes that transdisciplinary research and teaching and learning approach is the way to go in solving constant challenges that face the world. The study recommends that university faculties, schools, and departments should engage in transdisciplinary teaching, and learning and research.

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Introduction

Teaching and learning at universities take different forms or approaches depending on the background of an academic or university teacher. Some academics at universities do not have professional teaching qualifications, they use approaches that they observed while they were still studying, and that is how they were taught by their lecturers while they were doing a junior degree. Others have professional teaching qualification. This forms a foundation on which they build up a variety of teaching approaches that they can apply while they are teaching their students. Those who do not have the teaching professional qualification were encouraged to enroll for a Postgraduate Diploma in Higher Education (PGDipHE) as per the National Development Plan (NDP) that declares that any lecturing academic staff at HEI is a teacher, not a lecturer. The PGDipHE study material helps academic staff to harmonise the pedagogy, reflect on their practice, and develop their Teaching Philosophy, get equipped with teaching and learning perspectives that are developmental, inclusive, and ultimately promote students' epistemological access to learning. In the paper published by Mladenovici, et. al. (2021), they stated that there is a shred of evidence that emphasises the importance of pedagogical training programmes in advancing academics to increase their pedagogical skills. Mladenovici, et. al. (2021) further indicated that studies have shown that these programmes have a positive impact on the academics' conception of teaching and can help academics to make the transition from a content-centered approach towards a more learning-centered approach to teaching and learning. The teaching

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approach is the combination of one's intention of teaching and teaching strategy. The teaching and learning strategies or teaching approaches and conceptions of teaching have been found to correlate, and conceptions of teaching are considered to represent the basis for teaching practices (Gow & Kember, 1993, Trigwell & Prosser, 1996a, Eley, 2006; Kember & Kwan-Por, 2000) as cited by (Mladenovici, et. al., 2021).

Universities and academics have identified different approaches to teaching and learning. Klein (2017) and Hall et al. (2018) identify them as multidisciplinary (i.e., different disciplines working on different aspects of a problem independently within their disciplinary boundaries), interdisciplinary (i.e., restructuring and integrating existing disciplinary approaches to address problems relevant to all participating disciplines) and ideally transdisciplinary (i.e., seeking to integrate different lines of work from contributing disciplines to create new approaches or even new scientific disciplines) approaches. In addition to the above, there are also scholarship on teaching and learning, evidence-based teaching and learning, transdisciplinary teaching and learning and competence-based teaching and learning, and deep learning approaches among others. All these approaches have an influence on the students learning and behaviour.

An experienced academic can blend different approaches in teaching and learning, this may influence the learning of the students. For this paper, the chosen teaching and learning approach is transdisciplinary teaching and learning. According to Kember (1997) and Prosser, et. al. (2008), academics have adequate knowledge in initiating and guiding the processes of learning of their students. However, in their research, they realised that the academics' choice of a particular approach to teaching and learning may be based on their understanding of the subject matter.

In the book: *Handbook of Transdisciplinary Research*, edited by Hadorn, et. al. (2008), the foreword by Jill Jäger of the Sustainable Europe Research Institute in Vienna, Austria, states that in a world that is characterised by constant changes, there is uncertainty and increasing interconnectedness that is growing. There is a need for science to contribute to the solution of these persistent, complex problems. These problems include environmental issues such as climate change and biodiversity loss, poverty, security, and governance. For all these problems, progress in finding and implementing solutions has been very slow. The increase in the availability of scientific knowledge has not been reflected in decisive action. To resolve these challenges, a transdisciplinary orientation in research, education, and institutions should be introduced to overcome the disconnection between knowledge production, on the one hand, and the demand for knowledge to contribute to the solution of societal problems, on the other hand. This is achieved through transdisciplinary approaches in which academics from a wide range of disciplines can work together across knowledge compartments.

Literature Review

The paragraphs below discuss the literature based on the conceptual framework, history of interdisciplinary approaches, interdisciplinary teaching and learning and challenges of interdisciplinary.

Conceptual Framework

The study is underpinned by concepts that Nicolescu (2002) and Mokiy (2019) define as existing scientific approaches to the knowledge of the world that use linear logic. Mokiy divided existing scientific approaches into two groups. The first group provides the formation and development of a scientific worldview, that includes mono-disciplinary approaches, whereas the second group includes interdisciplinary approaches that include inter-disciplinary, multi-disciplinary, and transdisciplinary.

The mono-disciplinary approaches have shaped the scientific worldview. These approaches are designed to perform actions based on obtaining the maximum amount of knowledge about the object, highlighting the subjects of the study in the object, and the formation of theoretical principles and techniques of monodisciplinary research. The increasing complexity of the mono-disciplinary image of the study object creates the conditions for the emergence of interdisciplinary interactions in science. Such interactions are carried out in the framework of inter-disciplinary, multi-disciplinary, and trans-disciplinary approaches (Mokiy, 2019).

Mokiy (2019) continues to expand the second group on interdisciplinarity as applied to the general classification of scientific approaches, their contextual definitions are as follows:

- i. An inter-disciplinary approach is a way to expand the scientific worldview in the direction of enriching the knowledge, methodology and language of one scientific discipline at the expense of the knowledge, methodology and language of another scientific discipline. The main identification of interdisciplinary approaches is the establishment of subordination between the interacting disciplines. Interdisciplinary is also concerned with the transfer of knowledge and/or methods from one discipline to another, allowing research to spill over disciplinary boundaries, but staying within the framework of each discipline.
- ii. A multi-disciplinary approach is a way of expanding the scientific worldview in the direction of a holistic image of the studied object. Petts, et. al. (2008) define multi-disciplinary research as research conducted in several disciplines and pursuing several independent goals. Multidisciplinary approaches allow researchers to search for a combination of different subject areas that are important for the object under study. Within the framework of multi-disciplinary approaches, there is an opportunity to study an object with the methodology of different disciplinary and interdisciplinary approaches.

- iii. The trans-disciplinary approach is a way of expanding the scientific worldview, which consists in examining an object outside of any single scientific discipline. Trans-disciplinary approaches have arisen due to the need to study objects of increased complexity without their separation from the environment. Knyazeva (2011) states that in the absence of strict identification signs, people perceive the trans-disciplinary approach as a special type of scientific research that goes through, across the boundaries of many disciplines, going beyond them, which follows from the very nature of the prefix "trans".

In addition to the three approaches outlined by Mokiy above on different disciplines, Nicolescu (2002) identified the following:

- i. Intra-disciplinary is an approach to working within a single discipline (closed system).
- ii. Cross-disciplinary is an approach to viewing one discipline from the perspective of another.

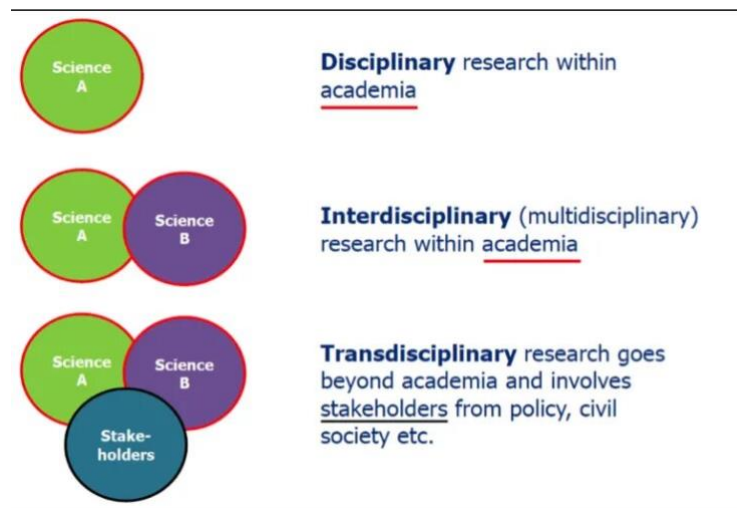


Figure 1: Towards Interdisciplinarity (Wahome, et. al., 2020)

History of Transdisciplinary Approach

The history of transdisciplinary research was illustrated by Hadorn, et. al. (2008). They put forward the origin of the transdisciplinary approach in research. They illustrated that the methodological division within the sciences continued with the development of the social sciences. They illustrate that the emergence of the social sciences during the 19th and first half of the 20th century was influenced by the serious problems experienced by the workers and the industrial working class due to **major economic, social, and political transformations**. The destructive influence of colonialism in the South got little attention at that time. However, the social risks of industrialisation and migration in the north attracted attention and stimulated innovative developments in academia, for example, in the 1920s, the Chicago School of Sociology in the United States, and shaped Human Ecology (Groß, 2004). In Europe, developments began earlier with Karl Marx (1818–1883), Max Weber (1864–1920), and Emile Durkheim (1858–1917), whose thoughts were taken up by Talcott Parsons (1902–1979) in his seminal theoretical work ‘The Structure of Social Action’ (Parsons, 1968). Max Weber related research in social sciences with knowledge demands for **societal problem-solving**. For him, the stimuli behind the posing of scientific problems were always practical problems, which thus coincided with specifically oriented motives and values (Weber, 1949).

Subsequently, the position of Sir Karl Popper (1902–1994) and Hans Albert (born 1921) in the 1960s has been to restrict scientific investigation of extra-scientific values to the functional analysis of means to certain ends. Jürgen Habermas (born 1929) in his critique of positivism in ‘Knowledge and Human Interest’ argues for three types of scientific rationality related to specific standards in research (Habermas, 1968):

- i. The instrumental rationality of the empirical sciences and their standards of quantification and experimental testing.
- ii. The rationality of the historical sciences, which concerns the role of knowledge in creating meaning for life and constituting personal identity in societal contexts, based on rules for hermeneutic interpretation.
- iii. The sciences of action, which are about societal transformations (in his later works this is based on communicative rationality as communicative action).

According to this conception participants engage in deliberation, following the regulative percept of an ‘ideal speech situation’ (Habermas, 1984, 1987). In transdisciplinary research, Habermas’ conception of communicative rationality is broadly referred to, as providing foundations for models of dialogue and knowledge claims. This typology of the sciences and their rationality replaces the strict distinction in antiquity of science as *epistème*, (scientific knowledge) on the one hand, and the knowledge of the lifeworld as

poiêsis (prudence), *praxis* (to produce), and *phronêsis* (deliberate about things that allow choice) on the other hand, by relating different conceptions of science with different types of interests: production, action, and deliberation.

Of major importance for transdisciplinary research is a further alternative to the positivist view and its ideal of a physicalistic unitary science, namely the development, beginning in the 1940s of systems theory in a broad range of fields. Systems theory was proposed by Ludwig von Bertalanffy (1901–1972) in biology, and developed by Norbert Wiener (1894–1964) in cybernetics; by John von Neumann (1903–1957) in game theory; by Claude Elwood Shannon (1916–2001) in information theory; and by Niklas Luhmann (1927–1998) in sociology, to mention some eminent individuals. Systems theory studies the abstract organisation of phenomena, independent of their substance, type, or spatial or temporal scale of existence. It investigates both the principles and the mathematical models used to describe them. These developments gave rise to the idea of an abstract structural unity of scientific knowledge against the background of the progressive fragmentation of the sciences into more and more specialised disciplines and thematic fields. The continuing differentiation in research and higher education, as well as in social institutions in general, became a major risk for modern civilisation, because specialisation prevents the recognition of possible negative side effects. Multidisciplinary research approaches an issue from the perceptions of a range of disciplines, but each discipline works in a self-contained manner with little cross-fertilisation among disciplines, or synergy in the outcomes. The growing awareness of these kinds of risks, therefore, stimulated integrative approaches labeled ‘interdisciplinarity’ or ‘transdisciplinarity’. It is in this context that Erich Jantsch (1929-1980) and others argued for innovations in planning for society at large, in a government–industry–university triangle which included a far-reaching reorganisation of higher education into an education-innovation system.

While these emerging ideas about inter-, cross- and transdisciplinarity are widely discussed with comparatively little impact on research or on institutional structures in universities, systems analysis, and modelling are advancing to become leading paradigms in the natural and social sciences. They are used for describing the complexity and for analysing the risks that global change poses to life-support systems as a result of the manifold and poorly understood negative side effects related to the increasing use of natural resources, and population growth (Forrester, 1961).

While it looks like transdisciplinary is not taken seriously, the concept emerged again at the Organisation of Economic Cooperation and Development (OECD). According to Gibbs (2022), the transdisciplinary concept was an issue at the International Conference on Interdisciplinary Research and Education in 1970 in Paris. The Conference was attended by very influential researchers who were to explore approaches to support universities in their quest to generate **innovative solutions to the challenges of societies at the time**. While the focus of the conference was on interdisciplinarity, the concept was defined by a group of distinguished scholars using an approach that is unquestionable and transcends the narrow scope of disciplinary worldview through an overarching synthesis. It is argued that three key researchers, Jean Piaget, Erich Jantsch, and Andre Lichnerowicz are generally attributed with leading the discourse of transdisciplinarity.

Transdisciplinary Research, Teaching, and Learning

In this paragraph, I will first illustrate interdisciplinary as a research area, and then as an approach to teaching and learning.

Appel and Kim-Appel (2018) define transdisciplinary or transdisciplinarity as practice and research that is conducted by academics who are from different disciplines, but working together to create new conceptual, theoretical, methodological, and transnational innovations that integrate and move beyond discipline-specific approaches to address complex problems.

Interdisciplinary research (IDR) which may be translated into teaching and learning, is a mode of research by teams of academics that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialised knowledge to advance fundamental understanding or to solve problems whose solutions are beyond of the scope of a single discipline or area of research practice (National Academies, 2005).

It is helpful to make a terminological distinction between these two different endeavours (the scope of a single discipline or area of research practice). One suggestion is to specify interdisciplinarity in the context of knowledge demands in the life world with the help of additional terms such as ‘interdisciplinary problem-solving’ (Clark, 1999; Deppert, 1998) or ‘goal-oriented interdisciplinarity’ (Hubert & Bonnemaire, 2000); or defining them as ‘Mode 1 interdisciplinarity problem-solving’ and ‘Mode 2 goal-oriented interdisciplinarity’ (Bruce et al., 2004). It is, however, more useful to use a different term, such as the term ‘transdisciplinarity’ (Jantsch, 1972). Lastly, Mittelstraß (1992) argues that transdisciplinarity is primarily a form of research for addressing and reflecting on issues in the life world.

Transdisciplinary research is needed when knowledge about a **societally relevant problem field is uncertain** when the concrete nature of problems is disputed, and when there is a great deal at stake for those concerned by problems and involved in dealing with them. However, by transgressing disciplinary paradigms and by surpassing the practical problems of single actors, transdisciplinary research can no longer build on clearly defined knowledge bases in science and the life world. Consequently, research problems that are soluble thanks to disciplinary paradigms of problem structuring and to the restriction of the range of interests considered, are turned into issues that scientists and agents can grapple with. The challenges mentioned give a reason for defining transdisciplinary research by the following requirements and goals to:

- i. Grasp the complexity of the problems,

- ii. Consider the diversity of scientific and societal views of the problems,
- iii. Link abstract and case-specific knowledge and constitute knowledge with a focus on problem-solving for what is perceived to be the common good (Hadorn, et. al, 2008).
- iv. Describe transdisciplinarity as the best-suited methodological and pedagogical strategy that meets the **unique challenges of the troubled world** that is affected deeply by the miraculous growth of knowledge enhanced by technological breakthroughs (Nicolescu, 2002).

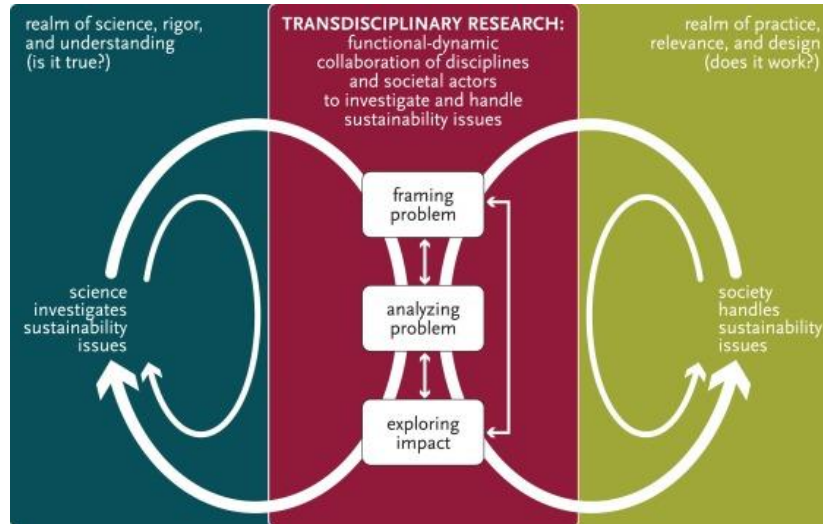


Figure 2: A transdisciplinary project connects scientific knowledge production and societal problem handling (Pohl, et. al, 2017).

The transdisciplinary research process connects **scientific knowledge production and societal problem handling (larger round arrows)**. Often the two processes are not explicitly related (smaller round arrows). The transdisciplinary research process consists of the stages of framing the problem, analysing the problem, and exploring the project's impact. Projects run through the stages in different orders (thin straight and angled arrows). During these stages, researchers of different disciplines collaborate and involve societal actors in a joint research and learning experience. The intensity of collaboration and involvement is a functional dynamic, that varies depending on the purpose of the specific stage. Two rationalities (thought styles) meet and must be balanced in this process: the thought style of science searching for truth and the thought style of practice interested in workability (based on Bergmann et al. 2005, Pohl and Hirsch Hadorn 2007, Krütli et al. 2010, Jahn et al. 2012).

Learning how to integrate disciplines towards exploring a problem or developing a solution or technology involves innovation of transdisciplinarity. This means that transdisciplinary innovation and transdisciplinary learning are practically interchangeable (Zafeirakopoulos & van der Bijl-Brouwer, 2018). The transdisciplinary teaching and learning approach is a way of moving beyond just teaching across disciplines using common themes, topics, or issues that thread through different courses. Transdisciplinarity requires collaboration between disciplines to create a cohesive curriculum in which students collaborate to solve multifaceted problems. A single disciplinary approach has limitations, particularly as it is concerned with the norms of that one discipline, ignoring other disciplines' contributions to the issue or potential solutions. Through interdisciplinarity, students can look at the same theme, issue, or topic from the perspectives of different, individual disciplines (Smother, 2020).

What Zafeirakopoulos and van der Bijl-Brouwer (2018) recognise as a key feature of transdisciplinarity is the importance of continuous learning and discovery, and this is very relevant in today's workplace. Academics need to be agile in their learning and the teaching of their students given they work on new challenges in new contexts, often with fewer resources, shorter timelines, and higher demand for quality outcomes. The changing realities mean that transdisciplinary academics must constantly need to adapt their teaching. The changing realities require them to become effective learners. In the context of innovation, the focus is currently on teaching professionals' specific innovation methods and tools, such as design thinking and lean and agile methods and principles. With all the innovation skills academics have, they should be supported in endeavour to achieve the requisite skills to engage students in the interdisciplinary lesson.

For example, transdisciplinary teaching and learning is an approach that may include diverse stakeholders coming together to teach a complex community health-related problem. It may involve education and health academics in co-creating new knowledge that stems from science and society that can be applied to address these complex real-life problems relevant to South Africa.

Challenges of Transdisciplinary Teaching and Learning

While there is a need for transdisciplinary teaching and learning in a world that is facing complex problems of a persistent nature is very evident, academics should not underestimate the barriers that are there to overcome in order to turn this emerging form of teaching and learning into a mainstream endeavour. There are barriers within the scientific community where many scientists prefer to continue their basic research and not confront issues and questions raised by non-scientists. While such basic research remains important, tackling complex issues of concern to the public and the policy-makers needs input from scientists and non-scientists, resulting in a different type of research (Jäger, 2008). McGregor (2017), no one perspective, discipline, or worldview constitutes a privileged place from which to understand the world or these intractable problems.

Smothers (2020) in her article, “Transdisciplinary and interdisciplinary approaches, has brought some of the challenges of transdisciplinary”. She stated that there are institutional challenges in the implementation of transdisciplinary programmes. The challenges include the complexities in coordinating such programmes, buy-in from the administration, the time and effort involved in putting programmes together, funding concerns, and recruiting stakeholders from within faculties and departments. Faculties, schools, and departments’ challenges include the requirement of cooperating and coordinating between different disciplines and creating cohesiveness across the program. In addition, transdisciplinarity requires merging divergent knowledge bases and value systems to create a new understanding of issues or challenges and their potential solutions. Therefore, the complexities involved in coordinating and managing these programmes can be a daunting undertaking.

Going further, faculties, schools, and departments’ challenges include the time-intensive nature of transdisciplinary programmes, the leadership and cooperation skills necessary to implement each piece of the program and synchronise efforts interfaculty, schools, and interdepartmental challenges, the intensely collaborative nature of transdisciplinarity for all stakeholders, and the need to consider problems from different perspectives and appreciate different disciplines’ approaches and values.

Methodology

This study aims to investigate the importance of transdisciplinary research, teaching, and learning in a world that is faced with multifaceted challenges.

This is a qualitative design paper where systemic desktop research was used. The systematic reviews follow structured and predefined methods to identify, appraise, and synthesise the relevant literature. Desktop research is a research method that involves the use of existing data. These are secondary collected and summarised data to increase the overall effectiveness of the investigation. Secondary research is much more cost-effective than primary research, as it uses existing data, unlike primary empirical research. The secondary literature was collected based on the history, challenges, and benefits of transdisciplinary research, teaching, and learning.

Discussion

The prevailing challenges of the world, make universities and their academics look for different possible ways of solving some of them. These challenges emanate from the provision of education, poverty, diseases, and environmental issues such as climate change and biodiversity loss, security, and governance. In solving constant world challenges, a transdisciplinary approach to teaching and learning comes into place. As far as I am concerned, universities are to solve some of the world challenges through teaching and learning, research, and community engagement. Transdisciplinary is based on the principle, tradition, or philosophy of Ubuntu/Vhuthu, where societal challenges are tackled. Ubuntu Philosophy as outlined so clearly in the call of this conference, is to express love, compassion, reciprocity, dignity, harmony, and humanity in the interest of building and maintaining a community with justice and mutual caring. In Tshivenda “munwe muthihi a u tusi mathuthu”. In addition, in the South African context, welcoming and treating visitors with love, respect, dignity, and compassion is central to the African philosophy of Ubuntu, which is a strong thread that knits the rainbow nation together as one.

While looking back at the history of transdisciplinary as illustrated above, where the methodological division within the sciences continued with the development of the social sciences. The emergence of the social sciences during the 19th and first half of the 20th century was influenced by the serious problems experienced by the workers and the industrial working class due to major economic, social, and political transformations. The destructive influence of colonialism in the South got little attention at that time. However, the social risks of industrialisation and migration in the north attracted attention and stimulated innovative developments in academia, for example, in the 1920s, the Chicago School of Sociology in the United States, and shaped Human Ecology (Groß, 2004). In Europe, developments began earlier with Karl Marx (1818–1883), Max Weber (1864–1920), and Emile Durkheim (1858–1917), whose thoughts were taken up by Talcott Parsons (1902–1979) in his seminal theoretical work ‘The Structure of Social Action’ (Parsons, 1968). Max Weber related research in social sciences with knowledge demands for societal problem-solving. If we can look at all (17) Sustainable Development Goals, 2030 Agenda, to achieve all of them from:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Transdisciplinary teaching and learning are key. Udovychenko, et. al. (2022), in order to successfully overcome the challenges of a dynamic external environment, specialists from various spheres of life should possess an expanded set of competencies and a high level of flexibility. In addition to experience and knowledge in the professional field, specialists should develop personal, creative, systemic, social-cultural skills in various disciplines with the possibility of their integration in their own activities. Such necessity arises in accordance with the goals of sustainable development, the emergence of complex problems requiring knowledge, abilities, skills from various disciplines (Risopoulos-Pichler, et. al, 2020).

Ramakrishnan (2022) indicates that the transdisciplinary was introduced as an explicit addition to interdisciplinarity to describe collaborations that go beyond coordinating interactions between different disciplines and aim at transcending them, therefore moving beyond disciplinary boundaries. In addition, transdisciplinary rests on the premise that researchers alone cannot solve these problems and that therefore academic boundaries also need to be transgressed through incorporation of extra-academic actors and knowledge into processes of problem definition, knowledge production and use. Transdisciplinary collaborations thus aim for both conceptual integration of different disciplines as well as a transgression of academic boundaries, which is not necessarily a part of interdisciplinarity modes of producing knowledge, to include other forms of knowledge. Transdisciplinarity points to disintegration of boundaries and the development of something entirely different. It is to be noted that despite these crucial differences, there are also commonalities in interdisciplinarity and transdisciplinarity.

In the literature above, transdisciplinary has its own challenges that include the complexities in coordinating teaching and learning programmes, buy-in from the university, faculty/school leadership and administration, the time and effort involved in putting programmes together, funding concerns, and recruiting stakeholders from within faculties and departments.

With all these challenges, transdisciplinarity requires collaboration between disciplines to create a cohesive curriculum in which students collaborate to solve multifaceted problems. A single disciplinary approach has limitations, particularly as it is concerned with the norms of that one particular discipline, ignoring other disciplines' contributions to the issue or potential solutions. Through interdisciplinarity, students can look at the same theme, issue, or topic from the perspectives of different, individual disciplines (Smothers, 2020).

Giacosa (2020) in this paper, *Transdisciplinary Teaching and Learning: An Experiment* which was presented in 6th International Conference on Higher Education Advances (HEAd'20) Universitat Politècnica de València, València, states that, transdisciplinarity is a student-activating approach. Even though it is student-activating, it is an academic who first must reflect on his/her teaching, if change is needed, then changes it. For the university academic in approaching reality of a transdisciplinary perspective, the first actions to be taken for the university or faculty that is up to the task of preparing students for the future, there should be an initiative of working in teams and networks on issues from different points of view. Scholars from different fields have shown that, through the search for knowledge and understanding outside the boundaries of the individual disciplines, teaching can once again play the key role in preparing new generations to meet and solve the constant challenges of the world.

Conclusion

In this paper, the author reviewed the literature that is based on transdisciplinary approach in research, teaching and learning and community engagement. In the conceptual framework, four approaches that accompany transdisciplinary were discussed, these are mono-transdisciplinary, intra-disciplinary, inter-disciplinary, multi-disciplinary. Many researchers according to reviewed literature

agree that transdisciplinary research and teaching and learning approach is the way to go in solving constant challenges that face the world. The 2023 Sustainable Development Goals also need transdisciplinarity to reach them.

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Institutional Review Board Statement: Ethical review and approval were waived for this study, due to that the research does not deal with vulnerable groups or sensitive issues.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

Conflicts of Interest: The author declare no conflict of interest.

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