

Transdisciplinary Attitudes In Teaching Practice: The Case Of A University In The Mexican Republic

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Abstract

Transdisciplinarity is the simultaneous interrelation between scientific disciplines to understand the present world and from a vision of unity of knowledge. It arises from the need to solve complex problems and opposes the segregation of knowledge caused by disciplinary training. The objective of this study is to identify transdisciplinary attitudes in university teaching practice in a higher education institution in the Mexican Republic. For this, a quantitative, cross-sectional study was developed, with an exploratory and descriptive scope, in which 422 teachers from the three campuses of the institution participated, who were administered an instrument to measure transdisciplinary attitudes. The analysis of the data revealed that attitudes related to epistemological openness, dialogue, permanent learning, and respect predominate in the teaching team, and the most incipient attitudes were related to reflection, organization, and complex thinking. A significantly higher development was observed in women regarding attitudes related to organization and dialogue, as well as greater intellectual rigor in teachers who work in undergraduate and postgraduate courses, than those who only work in one of those levels. These results are inputs for generating attraction strategies and teacher training that enables quality education.

Keywords: teaching staff; transdisciplinary attitudes; schooling; university.

1. Introduction

The teaching practice focused on the determination of didactic contents based on the disciplines has been a constant within all educational levels but particularly in university training (Bernik and Luna, 2019), even though professionals once they go out into the world work must focus on solving practical problems, in which the participation of professionals from various areas of knowledge is necessary, or in other words, experts in various disciplines (Córdoba, 2019). The above is due to the fact that the problems of any professional practice are framed in a complex context, which requires dialogue between knowledge.

That is why the transition from disciplinary education to transdisciplinary vocational training plays a preponderant role, especially if it is about helping university students better understand the work reality they will face, which is not only complex, but which is in continuous transformation (Ángeles and Cadena, 2021).

This reflection on the transition from disciplinary university education to one focused on transdisciplinarity is what gives guidance and support to this article, which seeks to identify transdisciplinary attitudes that university professors consider within their teaching work to subsequently determine training strategies that allow the strengthening transdisciplinary practices inside and outside the classroom. In this sense, the transdisciplinary vision in university education and, particularly, in teaching, encourages open dialogue between sciences and knowledge, since it is presented as a cognitive scheme that allows all disciplines to be crossed (Serna, 2022).

But what is transdisciplinarity? The concept of transdisciplinarity emerged in the 70's of the 20th century within the framework of the "First International Seminar

on Interdisciplinarity", where it was reflected that the disciplinary vision fragments knowledge, since it makes it impossible to understand realities. of the complex world that requires the systemic combination of multiple levels of research, education and innovation (Salgado and Aguilar, 2021).

According to Piaget (1970), transdisciplinarity is the highest stage of integration of disciplines, it is a type of activity generated by the need to solve complex social problems, characterized by the interrelation between scientific disciplines, so it concerns what "is simultaneously between the disciplines through the different disciplines, beyond every discipline, its purpose is the understanding of the present world with the imperative of the unity of knowledge" (Nicolescu, 1996, p. 35). For Lang (2012, p. 26) "transdisciplinarity is integrative reflective scientific knowledge, driven by methods that aim to solve or transition social problems and, at the same time, related scientific problems through the differentiation and integration of knowledge of various bodies of scientific and social knowledge.

For the Future Works Skills report (2020), many of today's global problems are too complex to be solved by a single specialized discipline (think global warming or overpopulation). These multifaceted problems require transdisciplinary solutions.

Transdisciplinarity not only seeks the crossing and interpenetration of different disciplines, but also aims to erase the limits that exist between them, to integrate them into a single system (Ander-Egg, 1996), which is why it can be said that it is the highest form. of integration and generalization of knowledge about the world and therefore, the best way to expand the horizon of the human and scientific worldview since it allows us to describe reality in all its diversity (Mokiy, 2019).

In a transdisciplinary context, professionals with diverse experiences work together to respond to a problem by breaking disciplinary barriers by using a shared

language and methodologies developed collaboratively to solve problems (Ciannelli et al., 2014), which promotes a “ most complex and efficient level of interaction between various disciplines with a high degree of cooperation and coordination based on common objectives” (Luengo and Martínez, 2018, p. 20). When this level is reached, “a consolidated common strategic vision is established, through a conscious and creative transformation project with viable alternative methodologies and a high level of solution to complex problems” (Luengo and Martínez, 2018, p. 20), thus achieving a conscious and democratic participation of each of those involved in the process, thus creating new cognitive paradigms and solutions that have an integrative and sustainable impact.

2. Transdisciplinarity in university education

As already mentioned, disciplinary and institutionalized education contributes to the dissociation of knowledge, preventing the university student from interrelation of knowledge, since it does not allow him to have a comprehensive vision of the professional task, which is why the confluence of disciplines is needed (transdisciplinarity).) for the understanding of reality and the search for solutions to work practice (Flores, 2022), which implies conceiving human rationality from another perspective and teaching to think “beyond” the explanations that can be given from a science. in particular (Salgado and Aguilar, 2021).

In this sense, installing complex and transdisciplinary thinking in the structures and programs of higher education allows it to evolve towards its most priority mission, the study of the universal (Nicolescu, 2013), a position that coincides with what Morin (2009) highlights the importance of seeing the whole and assuming the complexity of reality in all areas of study. And transdisciplinary education corresponds to “in vivo knowledge, where there is a concern for reciprocity

between the external world of the object and the internal world of the subject” ([Nicolescu, 2013, p. 26](#)); which promotes understanding beyond the accumulation of knowledge, in addition to being oriented towards wonder and collaboration, along with the inclusion of values and the search for harmony between the mind, emotions and body ([Nicolescu, 2013](#)). “The transdisciplinary approach is a commitment to the intentionality of a holistic education, with which it seeks to integrate the study of social demands, scenarios and complex problems with the different disciplinary references” ([Guzmán, et al., 2019, p 76](#)).

This vision of the training of university students is aimed at strengthening transdisciplinary skills, specifically judgment capable of solving problems in complex and dynamic situations ([Acevedo et al., 2020](#)), in addition to promoting in students the ability to reflect on their role in the world, the meaning of what they study and their objectives in life ([Roysen and Cruz, 2020](#)), for which the best path is the combination of theory and practice ([Fiala et al., 2018](#)). where the student body assumes the role of working together, in such a way that education is seen as the problematization of human beings in their interactions with the world (Freire, 1983) including scientific knowledge, but also artistic, cultural, spiritual and philosophical knowledge. ([Dravet, et al., 2020](#)). Transdisciplinary teaching goes beyond mere teaching between disciplines. Transdisciplinarity requires collaboration between disciplines to create a cohesive curriculum in which students collaborate to solve multifaceted problems, therefore, it requires innovative practices, cooperation and intentionality.

To achieve this paradigm shift in higher education, teachers are required to develop at least three fundamental traits of the transdisciplinary attitude: rigor, openness and tolerance (Nicolescu, 1996). Understanding the rigor in terms of the founded

argumentation of language on living knowledge, both internal and external, since transdisciplinarity is simultaneously a corpus of thought and a lived experience, which transdisciplinary language must translate into words and action. without having a slide to one side (thought) or the other (experience) (Nicolescu, 1996).

In this sense,

(...) transdisciplinary language is founded on the inclusion of the third party that is always found between the “why” and the “how,” between the “Who?” and the “What? This inclusion is both theoretical and experimental, which ensures the quality of the presence of the one who uses transdisciplinary language, achieving the search for the right place in oneself and in the other, at the moment of communication (Nicolescu , 1996, p. 99-100).

Moving on to the opening, this is of three kinds: 1) the opening of one level of reality towards another level of reality; 2) the opening of one level of perception towards another level of perception and 3) the opening towards the zone of absolute resistance that unites the subject and the object. The above entails the acceptance of the unknown, the unexpected and the unforeseeable, permanently questioning the answers accepted as temporary. Finally, tolerance highlights the realization that there are ideas and truths contrary to the fundamental principles of transdisciplinarity, seeking to overcome binary oppositions and antagonisms (Nicolescu, 1996). The transdisciplinary attitude, in general, transcends the construction of knowledge as an articulating process, and of confluence between diverse dimensions and perspectives (Vargas, 2015) and contributes to the need to have a holistic and dialogic vision of knowledge (Guzmán, et al. ., 2019).

According to Flores (2022) , these transdisciplinary attitudes are translated in teaching work into indicators, as follows: rigor in: reflection, organization and

epistemological openness; openness in: dialogue, complex thinking and holistic vision; tolerance in: lifelong learning, respect, versatility, equity and cooperation, which favors students' acquisition of higher-order knowledge and the development of skills to solve problems in practice (Rupnik and Avsec, 2020). Additionally, McDaniels and Skogsberg (2017) comment that transdisciplinary teaching environments promote the development of cognitive, interpersonal, and intrapersonal competencies, which foster effective relationships between diverse professionals and the communities they serve.

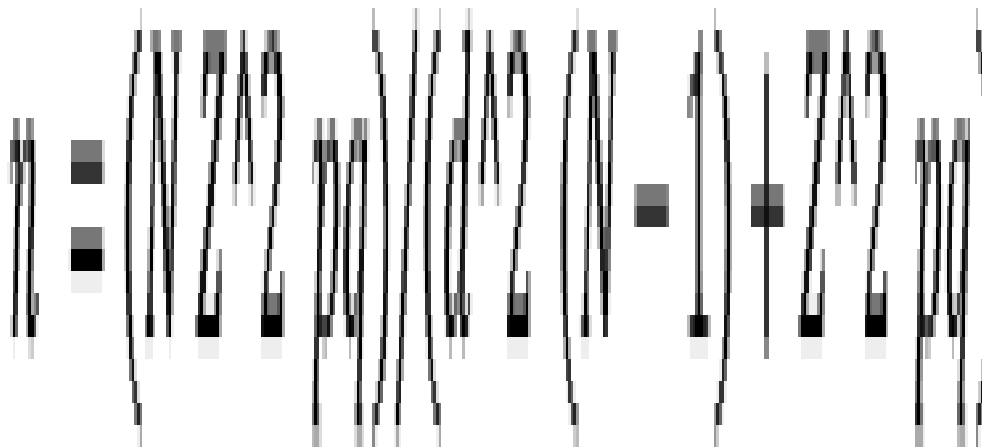
To achieve transdisciplinary learning environments, we must promote the use of active and collaborative teaching strategies such as: problem- and project-based learning, as well as design thinking that allow different levels of integration and cooperation, making teaching and learning an enriching and transformative experience (Rupnik and Avsec, 2020). The above will be even more effective when the connection of students to solve problems in their community is achieved, thus promoting the transdisciplinarity of knowledge and the interaction of the university with its closest environment, through the extension of culture (Mokhele and Pinfeld, 2020). In short, a transdisciplinary vision in university teaching incorporates the participation of various social actors inside and outside the university, so that students are able to develop and deepen sustainable and inclusive solutions (Urquiza and Labraña, 2022).

3. Method

Taking into account that the purpose of this research is to identify transdisciplinary attitudes in university teaching practice in a higher education institution in the Mexican Republic, a study was developed with a quantitative, transversal approach, with an exploratory and descriptive scope (Kerlinger and Lee ,

2002 ; McMillan and Schumacher, 2010 ; Hernández et al. 2014). This was the case, since the study variable was not manipulated, there being a single measurement that allowed data to be collected that could be analyzed through statistical techniques.

For data collection, the participation of the study population was considered, made up of the undergraduate and graduate teaching team of the three campuses of a private University in Mexico (n= 2,700). The only inclusion criterion consisted of being in active status as a professor at the University. In order to enable the generalization of results, the minimum required sample size was calculated through a formula for calculating samples in descriptive studies (Aguilar-Barojas, 2005), considering a 95% confidence level and a sampling error of 0.05.



= 337

Although the minimum sample size calculated was 337 teachers, the sample size achieved was 422, thus exceeding it. A description is presented in Table 1.

Table 1. Description of the sample

Aspect	Frequencies and statistics
Sex	Women = 44.8% Men = 55.2%
Campus	Aguascalientes = 25.6% Mexico City = 42.6% Guadalajara = 32%
Age	$x = 44.6$
Maximum level of education	Bachelor's degree = 8.3% Specialty = 6.2% Master's = 58.9% Doctorate = 28.7%
Years of experience as a university teacher	$x = 13.9$
Years of seniority at the University	$x = 9.5$
Hiring type	By subject = 61.6% Time = 38.4%
Educational level in which you teach	Undergraduate = 68% Postgraduate = 0.7% Undergraduate and postgraduate = 31.3%
Language in which you teach	Spanish = 80.1% English = 7.6% Spanish and English = 12.3%

Source: self made

To collect data, an electronic form (Google Forms) was built with two sections. The first, related to the sociodemographic variables described in Table 1. The second, with an adaptation of the Questionnaire to determine the level of transdisciplinary attitudes of teachers (Flores, 2022), consisting of 20 dichotomous items in which established agreement or disagreement. Table 2 presents the operationalization of the corresponding variable. The changes made to said questionnaire were related to the wording, in order to contextualize them at the level of higher education. Its dichotomous nature was also replaced, being considered a Likert-type scale, in which the teachers could determine their degree of agreement with the statements.

Table 2. Operationalization of the Transdisciplinary Attitudes variable

Dimensions	Indicators	Reagents
D1. Intellectual rigor	1.1. Reflection	1-3
	1.2. Organization	4
	1.3. Epistemological openness	5
D2. Opening	2.1. Dialogue	6-7
	2.2. Complex thinking	8-13
	2.3. Holistic view	14-15
D3. Tolerance	3.1. Permanent learning	16
	3.2. I respect	17
	3.3. Equity and cooperation	18-20

Source: Own elaboration, based on Flores (2022) .

Although the original questionnaire observed adequate psychometric properties (Flores, 2022), having made the changes, it was considered pertinent to explore

its reliability and construct validity. Regarding reliability, the internal consistency method was applied through the calculation of Cronbach's Alpha coefficient. This was calculated for the scale in general ($\alpha(\text{General}) = .60$), finding sufficient evidence to assume that the instrument enjoyed an acceptable level of reliability (Cabezas-Gómez et al., 2022).

To explore construct validity, the item-domain correlation method was applied. Since the items were ordinal variables and the dimension scores were quantitative variables, Spearman's Rho coefficient was used. For the interpretation of the results, the proposal of Dancey and Reidy was taken as a reference, who analyzed it from the psychological field and established that from .01 to .39 is low, from .40 to .69 is moderate, and from .70 to .99 is strong (Akoglu, 2018). In this sense, items with scores equal to or greater than .40 (at least moderate relationships) were considered valid. Data analysis allowed us to identify 6 items with correlations lower than said value. From dimension 1, R5; and from dimension 2, R7, R8, R9, R14 and R15. Regarding dimension 3, all items had moderate or high loadings.

Data collection was carried out during the months of February and March 2023. To this end, the academic secretariats of the different academic entities were asked to share the link to the electronic form with the teaching teams, promoting participation. Once this administration period was completed, a database was configured, which was processed in the SPSS Statistics 27 software in order to perform the necessary analyzes to address the research problem. Throughout the entire research process, the ethical principles in research promoted by the Publication Ethics Committee (COPE) were applied, among which anonymity,

confidentiality, informed consent, as well as the use of data stand out. for research purposes only.

4. Results

The research problem consisted of identifying transdisciplinary attitudes in university teaching practice in a higher education institution in the Mexican Republic. To address this intention, different analyzes were carried out that are presented in this section. The first consisted of calculating the average scores for each of the indicators and dimensions of the study. The results are presented in Figure 1.

The interpretation of the results was carried out considering that the scale values ranged between 1 and 5, with the closer they are to 5, the greater the degree of presence of each indicator or dimension. In this sense, it could be observed that D3. Tolerance obtained the highest score (3.97), being D1. Intellectual rigor obtained by the youngest (3.13). Looking at the scores, it could be considered that attitudes of tolerance tend to be strong among teachers, while those regarding intellectual rigor and openness are moderate.

From the perspective of the indicators, it was identified that the attitudes related to respect (4.62), lifelong learning (4.46), epistemological openness (4.44) and dialogue (4.38) reflected a greater presence in the teaching team. On the other hand, those related to reflection (2.73), complete thinking (2.97) and organization (3.01) were observed as the least present.

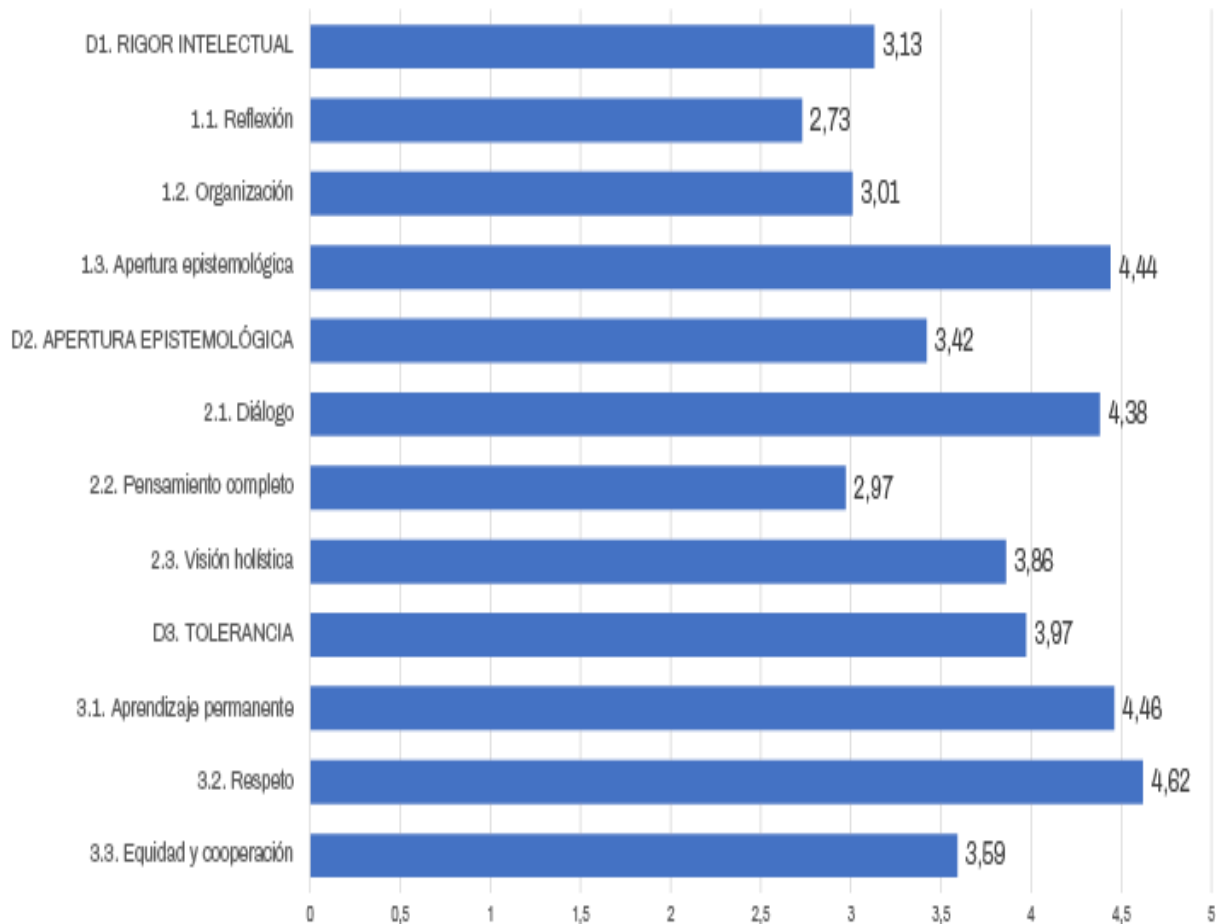


Figure 1. Graph of average scores of dimensions and indicators

Source: self made

In order to go deeper, we proceeded with a series of comparative analyzes of the results based on contrast variables of interest for the study. For the sex variable, a T Test for independent samples was applied, considering the significance based on the result of the Levene Test, aimed at determining whether or not there was homogeneity of variances. For the variables campus, degree of education, type of contract, level at which classes are taught and language, a univariate analysis of variance (ANOVA) was carried out. The results are presented in Table 3.

Table 3. Significant differences in dimensions and indicators

Variable	Indicator/Dimension	Socks	Hypothesis testing
Sex	1.2. Organization	Women = 3.22 Men = 2.84	Sig. (Levene) = 0.576 Sig. (ANOVA) = 0.004
	2.1. Dialogue	Women = 3.22 Men = 2.84	Sig. (Levene) = 0.004 Sig. (ANOVA) = 0.022
Campus	There is not enough evidence to assume significant differences		
Level of study	There is not enough evidence to assume significant differences		
Hiring	There is not enough evidence to assume significant differences		
Level	D1. Intellectual rigor	Bachelor's degree = 3.08	Sig. (Levene) = 0.113
		Postgraduate = 2.47 Both = 3.24	Sig. (ANOVA) = 0.017
Language	There is not enough evidence to assume significant differences		

Source: self made

In light of the comparative analysis, it was identified that attitudes related to organization and dialogue are significantly higher in women than in men. Additionally, it was identified that those relating to D1. Intellectual rigor (dimension 1) tends to be significantly higher in teachers who teach classes at both levels of higher education (undergraduate and postgraduate) and significantly lower in those who only teach postgraduate classes.

Regarding the sociodemographic variables of a quantitative nature (age, years of teaching experience and years of seniority at the University), Pearson correlation coefficients were calculated with the respective scores of the indicators and dimensions of the study. The results provided sufficient evidence to assume that these variables are independent of the degree of development of the different transdisciplinary attitudes that were studied.

5. Discussion and conclusions

As described in the first section, today's university faces the challenge of transdisciplinarity, an aspect that involves training students with a more comprehensive vision ([Flores, 2022](#)). This study has allowed us to have a first approach, in a specific context, to the state of its teaching staff in terms of transdisciplinary attitudes, which would be a first prerequisite to generate concrete transdisciplinary teaching strategies.

Among the main strengths of the study was the fact of having achieved a representative sample of the study population, having exceeded the minimum sample size, with the participation of teachers from the different academic entities of the three campuses of the University. In this sense, the results derived from the

analysis are generalizable to the institution, thus being relevant inputs for the understanding of transdisciplinary attitudes in the university teaching team, as well as an ideal source for the generation of strategies for attracting and training human talent. A tolerant attitude of learning and respect can be revealed in the results of this research, which in terms of the object of the study would favor transdisciplinary cooperation and the socialization of knowledge.

On the other hand, the lower dimensions, related to intellectual rigor, such as reflection and organization, can refer to the continuous management and administration tasks to which teachers are subject, in general, and which can hinder a necessary reflection on teaching performance and how to improve their practices on a continuous basis.

Regarding limitations, it was identified that the measurement instrument presented some problems regarding its reliability and construct validity, but was acceptable for the purposes of the research. From this perspective, it is considered advisable to carry out a thorough review of the wording of the items, in order to assess which ones should be maintained, modified or eliminated. Subsequently, carry out a new pilot study, in order to re-analyze the psychometric properties.

Given the relevance of the topic and in light of the emerged results, the carrying out of a study related to the analysis of transdisciplinary actions in teaching practice, as well as a qualitative approach on the perspectives of the teaching staff regarding the transdisciplinarity in higher education.

For now, this study sheds light on clear starting points that could be considered, from the management of teachers, to raise awareness on the issue, train and plan specific strategies that allow teachers to move from attitudes of tolerance towards a clear conceptualization. of what transdisciplinarity is and how to apply it from your

teaching practice with a view to being open to facilitating a greater crossing of knowledge and specific positions and strategies of transdisciplinarity in the planning of your university classes. Finally, it is already a very positive trait to find a spirit of cooperation, which would allow, in the future, to enrich the perspective of teachers with the contributions of other teachers, other knowledge and the possible approaches that the university itself presents to them.

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