

# Transdisciplinary Learning Community: A model to enhance collaboration between Higher Education Institutions and Society

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**Abstract**— The main challenges currently faced by *Higher Education Institutions (HEI)* to achieve their integration with social agencies, industry, and government are discussed. Faced with the demand for solutions to increasingly complex problems and the modernization of teaching approaches that address these problems, the *TransDisciplinary Learning Community (TDLC)* model is proposed as a dynamic path to help educational systems, specifically *HEI*, to face these challenges.

**Keywords**— *Transversal competencies, Transdisciplinary research, Educational Innovation, Higher Education Institutions.*

## I. INTRODUCTION

*Higher Education Institutions (HEI)* have been positioned as vital resources and contributors to the knowledge economy. Although their function as generators, applicators, and transmitters of knowledge for the benefit of society is well known, *HEI* still struggle to facilitate the development of solutions to complex societal problems and thus bridge the existent gap between educational programs and the demands of the different sectors of the society, industry, and government. *HEI* battle to shape the next generation of thinkers who will handle different methodological, creative, and analytical processes, and who will give innovative solutions to the (today and tomorrow), problems of the society is still on.

Specifically, in *México*, there are lags in higher education regarding its ability to generate and apply knowledge [1]. There is a significant gap between what is taught in *HEI* and the abilities needed in real life challenges once after graduation; in other words, the competencies learned in *HEI* are different from the competencies needed in real professional life. It is expected that the graduate students develop these skills and competencies in their professional

practice. While efforts to bring relevance to education have been notable in the last decade, much remains to be done to link study programs with the requirements that society and the economy demand. It is important to mention that some accrediting agencies such as *QS World University Rankings* use employability as an important indicator in the measurement of their rankings, which has made universities, students and employers reflect. The *QS Graduate Employability Rankings* is an innovative exercise designed to provide the world's students with a unique tool by which they can compare university performance in terms of graduate employability outcomes and prospects.

In *HEI*, a greater diversity of educational opportunities and new models of cooperation to facilitate and give relevance to learning are needed [2]. Internationally, many universities are taking active measures to renovate their study plans, some of them are introducing policy and curriculum changes aimed at increasing *non-academic* skills [3], while some others are developing programs that enhance research skills and critical thinking [4, 5].

A theoretical framework, is presented, that leads to the development of a *TransDisciplinary Learning Community (TDLC)*, as an effort to enhance the relevance of what is taught in *HEI*, strengthen innovation, data use, research, leadership, transdisciplinary, and cooperation with public and private universities and society. The purpose of *TDLC* is to challenge students to find solutions to real problems in transcendental learning environments in collaboration with colleagues from different subject areas, from different universities, and in close cooperation with industry. *TDLC* is based on real multilevel needs from *HEI* (local-internal level), small, medium, and big enterprises (local-external level), and national needs addressed in national and international studies (national-external level). Productivity and competitiveness of every country depend not only on the

amount of investment in knowledge generation [6], but in the transfer, application of creativity, originality, continuity, significance, and transcendence of that production of knowledge; research and innovative efforts should be focused on fulfilling that purpose [7].

The introduction in this paper justifies this research and explains the current situation of Mexican *HEI*. Section II introduces and defines the goals and challenges faced by *HEI* to cope with international competitiveness and social demands, it defines transversal competencies and transdisciplinary research and supports the inclusion of such skills in current curricula as a means to meet *HEI* current challenges; in addition, this section describes some examples of transdisciplinary research and the inclusion of transversal competency initiatives, this section reviews the *State of the Art* in this topic. Section III proposes a dynamic, transdisciplinary model that would help *HEI* to accomplish knowledge meaning, teaching, transfer, and integration. Section IV discusses the main challenges in implementing such a model in *HEI* and further implications, and section V concludes this research project.

## II. STATE OF THE ART

### A. Goals and challenges

One of the main challenges of *HEI* is knowledge transferring. Knowledge is the intangible phenomenon that gives a personal understanding of a subject or event; the person gains knowledge by evaluating, collecting, and organizing information that deals with subject's knowledge are not something by itself [8]. Knowledge transfer refers to the focused, unidirectional communication of knowledge between individuals, groups, or organizations, so the knowledge recipient (a) has a cognitive understanding, (b) has the ability to apply the knowledge, or (c) applies the knowledge [9]; the term as knowledge sharing for the same meaning will be used [10].

Nowadays, the international competitiveness of a country depends on the rapid accumulation of knowledge as a positive experience and there is evidence that this experience is primarily based on the innovative entrepreneurial education and real transfer of new technologies [6]. Thus, technology transfer is an essential factor that helps in building a competitive advantage, but it is difficult to implement because knowledge sharing does not happen automatically [11].

*HEI* and their leaders play an important role not just in an educational way, but also in the mission of research and services, whose function has always been to generate knowledge [6]. Sometimes this mission is forgotten, and universities have the challenge to reorganize their research and innovation area to develop knowledge sharing [12]. Today, many graduate programs do not include the development of competencies to establish their businesses, and they create businesses based on the knowledge acquired during undergraduate education; this situation puts graduate in a clear disadvantage [13]. The challenge is to establish a forming mechanism which could be triggered by the labor market demands, in organizations where people continually

expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together [14].

### B. Transversal competencies & transdisciplinary research

Many countries (e.g., Australia, Hong Kong, India, among others) have moved towards the integration of transversal competencies into existing curricula in their *HEI*. Adding them to the already existing curriculum as new subjects or as new content within traditional subjects, by integrating them as cross-curricular competencies that underpin all school subjects, or by making transversal competencies part of a new curriculum, transforming the traditional structure of school subjects and making universities more like learning organizations [15].

Transversal competencies in education are defined as a framework consisting of four broad domains:

- (1) critical and innovative thinking,
- (2) interpersonal skills,
- (3) intrapersonal skills, and
- (4) global citizenship.

In the first domain, critical and innovative thinking, creativity, entrepreneurship, and resourcefulness, application of skills, reflective thinking, and reasoned decision-making are propelled. The second domain corresponds to interpersonal skills such as communication, presentation skills, leadership, organizational skills, teamwork, collaboration, initiative, sociability, and collegiality. The third domain, intrapersonal skills, refer to self-discipline, enthusiasm, perseverance, self-motivation, compassion, integrity and commitment. The last domain, global citizenship, refers to a mentality of awareness, tolerance, openness, respect for diversity, intercultural understanding, the ability to resolve conflicts, civic/political participation, conflict resolution, and respect for the environment [5].

Transdisciplinary research is broadly defined as a holistic approach that goes beyond the perspectives of distinct disciplines to create a common conceptual-theoretical-empirical structure for research. [16] argues that this kind of research puts the problem at the center of research, determining the use of multiple disciplinary resources; the problem is seen from a holistic perspective integrating the knowledge from different disciplines.

Transdisciplinary research practices, in teachers and students, eliminate the boundaries of the disciplines through a process of strong collaboration [17-19]. In order to function, it is necessary the sharing of knowledge, conceptual frameworks, tools, methodologies, and technologies from every discipline to solve common unstructured problems. Hence, the main characteristic of the transdisciplinary research project is the sustained collaboration and high quality of integration among methods and approaches of the different disciplines [20]. According

to [21], transdisciplinary practices seek the unity of knowledge that was previously parceled by disciplines in common study plans.

### C. Examples of transversal competences & transdisciplinary research

Brushstrokes of the implementation of programs that consider transversal competencies are currently found in educational systems of countries such as Hong Kong, Ecuador, England, and *Tecnológico de Monterrey* in México. For example, the educational reform of Hong Kong contained generic skills wherein the senior secondary curriculum had a new compulsory subject, Liberal Studies [5]; in Ecuador, *HEI* have realized that students require to develop skills such as planning, decision-making, and the ethical meaning in a transversal way [3]; the British Council in England [4] has also developed core skills and competencies in order to improve learning outcomes for students based on the UNESCO working definition of transversal competencies [5]; and, in Mexico, the *Tecnológico de Monterrey* implemented a new educational model called *Modelo Tec 21*, one of its components is the use of the challenge based learning as a pedagogical model that involves the student in a real problematic situation, relevant and related to the environment, which implies the definition of a challenge and the implementation of a solution. Competences that it seeks to develop *Modelo Tec21*, [28]:

1. *Self-knowledge and management*: Build a personal wellness project and professional, through responsible reflection and the integration of emotional and intellectual resources.
2. *Innovative entrepreneurship*: Generates innovative and versatile solutions in changing environments that create value and impact positively to society.
3. *Social intelligence*: Generates effective collaboration environments and negotiation in multicultural contexts with respect and appreciation for the diversity of knowledge and people.
4. *Ethical and citizen commitment*: Implement projects oriented to transformation of the environment and the common welfare, with ethical conscience and social responsibility.
5. *Reasoning to face complexity*: Integrates different types of reasoning in the analysis, synthesis and problem solving, with provision to continuous learning.
6. *Communication*: Use different languages, resources and strategies communicative, according to context and effectively, in their interaction in professional and personal networks.
7. *Digital transformation*: Optimizes solutions to the problems of its professional field with the intelligent incorporation of technologies cutting-edge digital.

Other cases of success incorporating transversal competencies with transdisciplinary research programs are the TREC Center by the Washington University School of Medicine, the Transdisciplinary research projects by the University of Technology Sydney (UTS), the Trans Design

project by Parsons The New School, and the Transdisciplinary Research Academy from Texas (TTUTRA) Tech University.

### III. RESEARCH MODEL PROPOSAL

A multilevel collaboration model is presented to achieve sustainable partnerships with the aim of generating knowledge and solutions to global problems in a collaborative way, shortening the existing gap between the academic world, society, and governmental agencies. The model addresses real needs on multiple levels in which *HEI* are inserted:

- (1) internal needs from inside the *HEI* (local-internal level),
- (2) external needs (local-external level) of small, medium and large companies of the locality, and
- (3) external needs addressed in national and international studies (national and international-external level), for the benefit of society, Fig. 1.

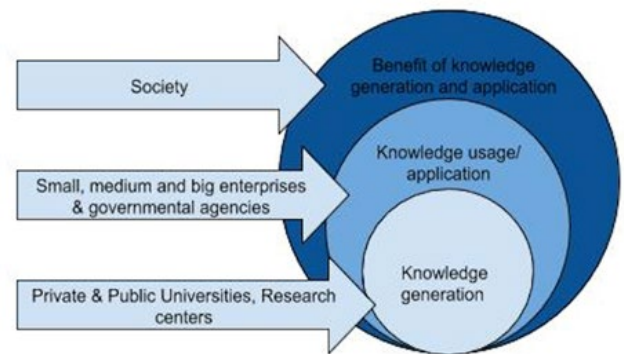


Fig. 1. Collaboration Model to achieve sustainable partnerships.

Based on this model, the *TDLC* is presented as a means to strengthen innovation, data use, research, leadership, transdisciplinary, and cooperation among public and private universities and society. In the first level, *TDLC* aims to promote research that brings together information, resources, data, theory, methods, and people from more than one discipline, from more than one university, and more than one enterprise, encompassing the efforts of many over one real problem or necessity. In the second and third level the specific aim of *TDLC* is to strengthen and complement *HEI* educational programs, as students participate in transcendental learning environments finding solutions to real problems, in collaboration with colleagues from other subject areas, from other universities, and in close cooperation with small, medium and big enterprises and governmental agencies, developing socially responsible entrepreneurship. To do so, the *TDLC* has to be integrated into *HEI* educational programs. Regardless of the method of insertion. [5], in Fig. 2 a possible process of insertion of *TDLC* is presented.

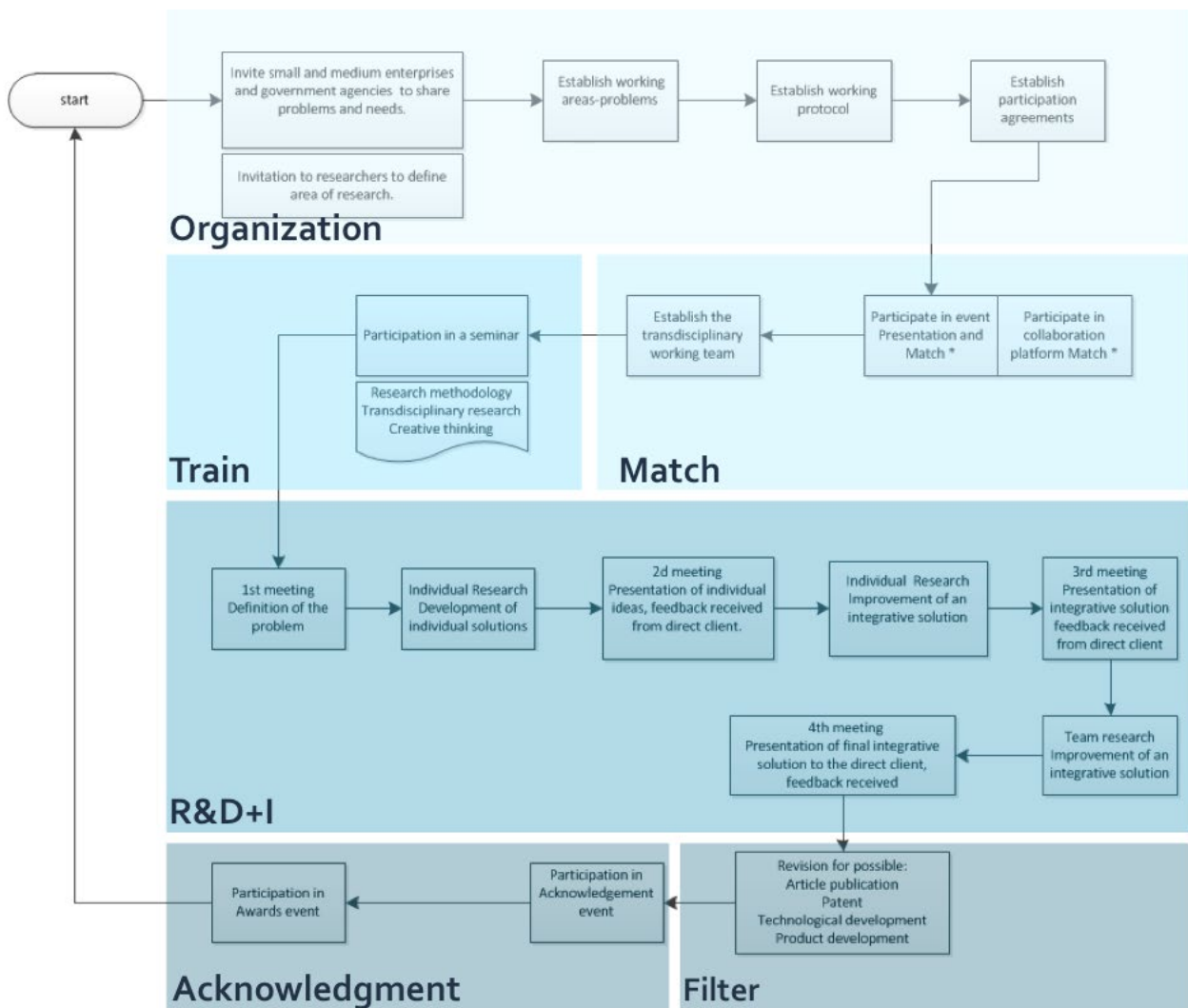


Fig. 2. Model of the process of insertion of TDLC in HEI

TDLC insertion model is based on reviewed instructional design theories and models for effective learning environments. It is ruled by the following instruction principles [22-24] to promote meaningful learning:

- (1) learning is promoted when students participate in solving real-world problems,
- (2) learning is promoted when existing knowledge is activated as a basis for new knowledge,
- (3) learning is promoted when new knowledge is shown to students,
- (4) learning is promoted when the student applies new knowledge,
- (5) and learning is promoted when new knowledge is integrated into the real world of the student.

These principles were considered because they have been empirically tested in different scenarios with positive results [25-27].

TDLC insertion model is a loop or circuit including six stages:

- (1) Organization
- (2) Match
- (3) Train
- (4) Research & Development + Innovation
- (5) Filter, and
- (6) Acknowledgement.

In the *Organization* stage, universities manage and establish working areas, problems, and working protocols. The transdisciplinary learning community starts at the *Match* stage; at this point, people are "hunted" to shape the transdisciplinary working team; when acting globally, this can be done in a digital match platform. After that, *Training* in innovation and creative thinking is necessary to cultivate an innovative and collaborative spark in all members; the quest for understanding when working with different disciplinary domains is not easy to accomplish, so this stage is of vital importance to create a safe learning environment that fosters strong ties of participation and identification of members with the community to facilitate the sustainability of innovation proposals over time [7]. *Research & Development + Innovation* integrate the next stage, in which transdisciplinary meetings to work in collaboration are

performed. The next stage (*Filter*) corresponds to a review for possible article publication, trademark registration, or patent application, technology development, product, service, or process development. The final stage corresponds to *Acknowledgement*, at this moment information goes public, and the loop restarts as new gaps are identified for further implications and future research questions, giving continuity to knowledge generation, this could be with the same transdisciplinary team or with a new one based on the knowledge already generated.

#### IV. MAIN CHALLENGES

Traditionally, in *HEI* the courses in the curricula functioned as the center of its operation. The new educational models at the top level are opting for a change of core: the needs of the environment. The primary learning units thus become applied challenges that allow universities to generate useful and valuable knowledge to be applied in compelling and innovative solutions. However, the road to change in traditionalistic educational systems is winding and uneven, full with more slopes up than slopes down. While implementing a model like the one presented in this article, the administrative, organizational and professional changes behind the scenes are the biggest challenges.

Another significant challenge of this model is to accomplish meaningful cooperation and collaboration between experts, students, and teachers from different disciplines as disciplinary jealousy is a common trait in academia. In addition to this, attention should be paid to agreement protocols while searching for collaboration among different universities and enterprises, as legal issues in patents and trade secrets may occur.

Subsequent research, once the process is applied, will study the *Research & Development + Innovation* stage in depth, since it is considered one of the most challenging and lengthy parts of the process in which tensions may arise.

Through this initiative, study how collaboration and internal and external resources drive knowledge creation and application is an important issue. As it is believed that academic collaboration from multiple disciplines drives knowledge creation, whereas the collaboration with industry partners and government agencies drives knowledge application. The primary goal of models is to encourage people to participate and collaborate with faculty members from other universities, colleges, students, government, enterprises, and every stakeholder interested in the solution of a specific problem. New practical initiatives in transdisciplinary approaches and transversal competencies are needed as the concepts are still a work in progress and the debate of its functionality and application endures in *HEI* [28].

The model and process presented seeks to solve a series of challenges faced by *HEI* in their quest to boost educational innovation networks in two ways:

- (1) gain relevance while giving solutions to the demands of today's society, and
- (2) achieve a collaboration that leads to the design of high-level innovations.

It is necessary to shape the next generation of entrepreneurs as thinkers who can handle transversal competencies along with methodological, creative and analytical skills because they will give innovative solutions to the problems that concern us as a society, today and in the future. The challenges must not cloud *HEI* goal: provide comprehensive training that allows its students to enhance and develop skills to become leaders that can successfully face the actual and future challenges and opportunities.

#### V. CONCLUSIONS

A new educational model is proposed where the needs of the society are main driven forces, and useful and innovative solutions are the main contributions. Based on cooperation/collaboration from different disciplines and stakeholders, research and development plus innovation as enablers, knowledge creation and application will be generated.

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