



Regional Innovation Cluster: The Role of the Entrepreneurship as a Tool for Closing the Gap Between Engineering Education and the Challenges of the Local Communities.

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**Engagement in Practice: Regional Innovation Cluster: The Role
of Entrepreneurship as a Tool for Closing the Gap Between
Engineering Education and the Challenges of Local Communities.**

1. Introduction

Today's education is facing the challenge of preparing students and professionals to thrive in a fast-changing world. To this end, students should develop abilities like critical thinking, problem solving, persistence and collaborative work, besides science, math and language. However, a lot of countries are not working to develop these abilities [1].

In order to strengthen the connection between what students need to learn and what they actually do in the classroom, is to face students with problems of their context. This is called a perspective of Challenge Based Learning, where students can apply what they learn in real problems, they discover by themselves the answers, they can implement them and they can interact with all the key players of their context [2]. This educational role mixes the educational experience, with educational methodologies and personal behavior [3].

In this article we will talk about the Challenge Based Learning (CBL) as an educational opportunity for developing community work in the classroom. We will see some opportunities and difficulties of this approach. We will introduce the Regional Innovation Cluster as an initiative for articulating a CBL approach in Colombia. Finally, we will see some results and relevant experiences from this initiative.

2. CBL as an opportunity to develop community work in the classroom

According to the Association for Experiential Education, it is important that educational practices create scenarios of co-creation with communities in vulnerability situations, as it calls for the student to focalize its academic interest in developing a concrete action that has a tangible evidence as a transformation of reality [4].

CBL *“is a pedagogical approach that actively involves the student in a real problematic situation, that is relevant and that it's connected with the environment, and that implicates the definition of a challenge and the implementation of a solution”* [5]. This means that CBL can be applied in study areas like science or engineering and calls for a student action in order to solve the problems they face [6]. This approach emulates the experiences professionals live in their normal work environments [7].

In the community case, students work with the support of their teachers in the creation of solutions to real situations that communities propose, where the primary interest is the exchange of knowledge and experiences. Different from other approaches, CBL allows students to analyze, design, develop, and seek to execute the best solution to face the challenge. These solutions are validated, appropriated and measured by the communities where the problematic situation is faced [8].

According to the Engineering Investigation Center VaNTH ERC, formed by MIT, Harvard, Vanderbilt, Texas and Northwestern universities, the CBL approach allows that classroom work and the process of learning to be focused on the student [5]. With this idea, CBL is an approach that presents multiple opportunities in the educational environment. Some of them are the students creating process and the universities' awareness with their context. There are already several examples where CBL is being used and shows a great support for students to apply their theoretical concepts [9].

However, it's also important to mention that in the context of community work, CBL presents various difficulties. On one side, in an approach that requires that the teacher decides to assume a facilitator role where his value is not in knowing the solution, but in accompanying the student in finding a proposal that is consistent with the challenge presented. This requires that the teacher has certain strengths, abilities and methodologic preferences. On the other side, not being a traditional educational approach, students are not familiar with these dynamics which can generate uncertainty on the process. Furthermore, for a learning method to work, it must be appropriated by the students and it must be suitable on the topic that is being thought; CBL can be very effective for certain students or areas, but possibly not for everybody, nor for a whole university career [5].

This means that the process must be mediated from a co-creation perspective where the community has an active role primarily in the challenge's decision and in how the process is expected to be conducted [10]. Under this scenario, at the end of 2016 a social entrepreneurship proposal named *Regional Innovation Cluster* was started. It has as its mission to close the gaps between the academic scenario and the rural communities' necessities, with the purpose to facilitate benefits for both parts [11].

3. Regional Innovation Cluster: A mediation effort between the classrooms and the rural communities

Rural communities in developing economies have specific knowledges of their fields, but they need new ideas and knowledge in order to create new opportunities. The development of the productive sector needs business experts, lawyers, designers, mechanical engineers and a lot of others disciplines to thrive as a value chain in the economy. In contrast with the former scenario, we see every day in universities students and professors that dedicate hours to the development of investigation projects. If we analyze universities projects, in average, a student consumes 300 hours researching and developing his project. Estimating this scenario to the 2 million students that are in Colombian universities, we are talking of 600 million of hours of research that have the potential of transforming the country's reality [12]. The mission of the Regional Innovation Cluster is to be able to articulate those rural community necessities with university students and teachers.

The Regional Innovation Cluster is born at the beginning of 2016 as a social entrepreneurship that transform communities' necessities in co-creation challenges, which can be addressed during an academic semester by students and teachers. The Cluster seeks to articulate efforts from multiple Superior Educational Institutions in Colombia, with the purpose of catalyzing regional innovation processes, in the context of Sustainable Development Objectives. Challenges are designed before the beginning of the academic period considering the communities' interests. Through several workshops with the communities, a portfolio of challenges is made and shown to universities students and teachers. During the academic period, a whole experience of accompaniment to the educational space is developed. At the end results are communicated through multiple channels: impact memories, digital platforms, among others.

4. Partial results of the Cluster in the implementation of CBL.

As it was mentioned before, the Cluster is born as an idea at the beginning of 2016, but it's only until the second semester of 2017 (2017- II) that its value proposal is defined as a model of

social business, where universities are consolidated as its clients by a membership payment. Here is some of the statistics of the Cluster’s participants.

PERIOD	2016 - II	2017 - I	2017 - II
NUMBER OF CHALLENGES	2	4	14
REGIONS	Guasca, Cundinamarca. Ciudad Bolívar, Bogotá.	Guasca, Cundinamarca. Ciudad Bolívar, Bogotá.	Guasca, Guachetá, Carmen de Carupa and Fusagasugá of Cundinamarca. Ciudad Bolivar, Bogotá.
UNIVERSITIES	Sergio Arboleda University. Los Andes University.	Sergio Arboleda University. Nacional University.	Sergio Arboleda University. Nacional University. Cundinamarca University.
NUMBER OF STUDENTS	35	50	109

Through these experiences we defined some strategies in order to tackle the CBL methodological difficulties. One of them is to generate support networks among teachers from different courses, areas and methodologies. To do this the “Academic Agenda” was developed, it was only for teachers’ use during the period, with the objective of sharing learning information and methodologies relevant to the Cluster’s dynamic. As such, in this “Academic Agenda” academic spaces were sought to show the Cluster’s work and to improve the teachers’ visibility, such as educational congresses, entrepreneurs’ workshops, generation of academic papers and thus to motivate professors interested in generating a social impact in their context. In the last experience, a network of 6 active professors was formed.

At the end we found that one of the most important difficulties of implementing the CBL process was the effective articulation of interests and goals between the communities’ expectations and the courses’ deliverables. In the Cluster’s dynamic it was evident that this was one of the main difficulties and it was clear the importance of having an actor that effectively articulates these interest between all participants. Another difficulty was the communication problem between students, teachers and community due to the lack of clarity on the common goal to achieve.

Results achieved in terms of community impact is explained above with a experience. This experience was developed during the 2017-II version of the Cluster, concretely in the Cundinamarca University. A challenge that was proposed by the ASOPROCAMPO producers’ association from the following question: How can ASOPROCAMPO increase the market share for its production of quinoa and strengthen its associativity?

5. Community Impact Experience

5.1 Context

Villa de San Diego de Úbate is the capital of the Ubaté province, located in the north of the department of Cundinamarca, Colombia. A diversified country, who's economy still has agriculture as one of its fundamental axis. The Cundinamarca University is in the municipality of Ubaté, and its students joined the Regional Innovation Cluster in august 2017 through an academic space denominated "Project formulation". Four of them: Yéssica Alarcón Pinilla, Diego Luis Gonzalez Coronell, David Antonio Morales and Carol Jeraldin Rodriguez Reyes, chose the ASOPROCAMPO association, a quinoa producer, amongst other agricultural goods and located in the Carmen de Carupa municipality, located in the same province.

5.2 Community necessity and methodology

The students at the beginning, during a collaborative workshop with the members of the association, identified that for the quinoa production many processes were realized by hand, one the students identified as the cause for the low performance in production, is the process for removing saponin of the seed, that consist in washing the quinoa with great amounts of water while rubbing them with your hands, a process that demands a lot of time, increases the costs and discourages producers, a reason why in the middle of the season they decide not to cultivate anymore. In some next meeting between students and communities, a proposition was made to use handmade system based in a bicycle (bike-machine), that allows the community to do the process without the use of water and much faster.

5.3 Results in the community

As a result, not only was a first prototype of the mechanical system of the process for removing saponin achieved, an appropriation of the association's identity was also gain through the development of accessible technologies, because all its members actively participated in the design, the gathering of materials, construction and tests of the system, Through the research for an improvement in the process, invaluable human dynamics were accomplished for the association: motivation, sense of belonging and appropriation of the capacities that they can use to improve its process.

The members of the association that led the process, confirmed in the results' socialization that they were grateful for the work done. At the beginning they thought that they were giving help in the learning experience of the students, and it turned out that they too were living a learning experience. Furthermore, they highlighted the students' presence as agents that support the development of a sector so sensitive for the national economy. *"The countryside is the future of Colombia and we can't abandon it. Very good because universities are accompanying the agriculture"* Mr. Alvaro – member of ASOPROCAMPO, played a major role in the development of the created system.

6. Next steps

From the results analysis of this experience, some changes in the Cluster methodology are going to be made. Among these changes is the reinforcing of the Cluster's team presence in the main moments of decision between the community and the students, in order to keep track of the project's path and to be able to accompany the challenges in a more personal matter. Also, the strengthening of the teachers in co-creation tools will also take place since is important to reinforce the facilitator role that requires the CBL approach. In investigational terms, it will be evaluated if these changes reinforce the Cluster's articulation role with the goal of consolidating the value that it adds to the proposition.

7. Conclusions

Currently there are several educational methodologies that seek to strengthen the capacities and competences of students around innovation, some of them are taken outside the classroom like the CBL approach, which changes the magistral classes methodology for one that is based in challenges or problems of the context. Through this paper's research and the development of an applied CBL initiative in Colombia called Regional Innovation Cluster, it is concluded that the methodology presents positive results in the development of competences in students, in social contribution and the articulation that the university has with its local context. However, being a relative new methodology and with a multisector and multi-actor dynamic, it presents various implementation difficulties that demand a more intense accompaniment in the development of the methodology.

8. References

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