THE "PROYECTO AULA" OF THE UNIVERSIDAD VERACRUZANA TO NEARLY FOUR YEARS OF ITS INITIAL PROPOSAL IN THE FACULTY OF ENGINEERING VERACRUZ, ACHIEVEMENTS AND EXPECTATIONS

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Abstract

The "Proyecto Aula" (PA) -Classroom Project- of the Universidad Veracruzana (UV) has gone through several stages from its conception and initial implementation. The academic community, teachers and students who have implemented the methodologies and strategies suggested by this initiative have given their opinions both for and against the project. The UV rectory has made significant efforts to make PA apply to each and every one of the educational programs offered, the reality is that while PA coverage has grown considerably, it is yet not total. It just is not easy for such a significant change in the current paradigm of teaching and learning to consolidate in a span of less than four years in an institution as large as it is the UV.

In the Faculty of Engineering / Veracruz, progress has been significant and an important number of teachers have embraced the project and apply it daily in their teaching practice. At first, of course, there was rejection and misunderstanding of the fundamental ideas of PA; it seemed to be a radical change in the teaching practice and that, instead of helping, became an obstacle.

Over time, the curriculum of the courses have been adapted to the proposal of the PA so that today, we can say that it is not surprising that students and teachers relate to PA with familiarity. The expectation is to reach 100% coverage in engineering programs taught in the Faculty.

New ideas are already being used to consolidate the PA throughout the UV, and this document refers to such concepts as well.

This work contributes to the dissemination of information that may be of value to academics involved in innovation projects in the field of higher education.

Keywords: Educational Innovation, Teaching and learning process, Competencies, Teaching strategies, Instructional design.

1 INTRODUCTION

The Universidad Veracruzana is constantly working to address new trends in education, this allows it to be a competitive university that stands out among the best in Mexico. For the past few years, the institution has strongly introduced "Proyecto Aula" (PA) -Classroom Project-, which is to change the traditional way of teaching; massively implementing the use of information and communication technologies (ICTs), the development of complex tasks by the students, which are aimed at solving real-life problems and finally linking teaching with research, as mentioned by Vidal et al. [1]. These three pillars have shaped the mentioned PA, but after achieving the training of most academics of the Universidad Veracruzana, time has come to begin a new stage in the strategy for the teaching and learning process, strategy that takes up one of the pillars of the PA, which is the link between teaching and research; that is, to motivate the academics to do research and get the students involved in these projects, to learn about a specific topic and also to conduct research in any of its variants, namely, documentary research or field research. The result in the formation of these students is evident, as many of them follow this trend and place themselves in a first stage as interns in research centers and institutes and, in a second stage, they continue their education by studying a national or international postgraduate.

In the Faculty of Engineering, this strategy is paying off, because as time goes on, more academics engage in research activities and form working groups with students, resulting in the training of students, the development of experimental prototypes, the production of technical and scientific articles, and an increasing number of academics with recognition by academia or research institutions.

It is important to realize that in the Universidad Veracruzana, as in many other higher education institutions, we face the challenge of resistance to change, so it is needed to work primarily with academics for them to learn to conduct research, and convince them that the extensive experience they have gained in industry can be oriented so students learn how to do research. However, as mentioned by Sánchez-Puente [2] - A researcher can not be improvised; experience shows that to train researchers is an operation that can not be carried out with administrative hurries, nor it can be planned with the criterion of "for yesterday" -.

To nearly four years after starting with the PA in the Faculty of Engineering / Veracruz, this paper discusses its acceptance by students and highlights the benefits of linking teaching with research.

2 BACKGROUND

Educational innovation for the teaching and learning process in middle school and higher education levels in Mexico, started in private institutions and militarized government schools; nevertheless, in public schools, these educational innovation initiatives have been introduced gradually, given the need to become quality institutions, recognized and endorsed by accrediting instances. The tendency then for higher education institutions (HEI) is to have quality academic programs, accredited by these instances, which has sparked massive training of their research teams (RT) to make use of new technologies in the process of teaching and guiding their students in the ways of research. The latter has led many HEIs to hire academics with a master or doctorate degree, in order to promote the link of teaching with research.

Huet et al. [3] mention that to achieve educational quality assurance at the higher education level, commitment is required, not only from students and teachers but also from directors and administrative staff, to prevent the improvement process from failing at any level. This essentially sounds good, but implementing it is a real challenge, because not all participants in the process of improving institutional quality are really interested.

As for the students, the current trend is to spend a lot of time accessing social networks and playing video games, and against that, not much can be done. Another issue is the fact of allowing to enroll, applicants who failed the admission test, thus contributing to the low academic performance of the students in the classroom, since these students usually do not have the profile required for a career in engineering and this condition reflects from the first semester. This enrollment option is due to the fact that many students that did pass the admission test, choose to study in other institutions, therefore leaving vacancy places. These places are offered by the institution, in stages, to those students who are top ranked on the list of candidates.

Cabral and Huet [4] mention what the new paradigm in education promotes, that is, it allows the student to become more involved in research and experimentation, giving the teacher the roll of facilitator, who leads and guides the students in their academic work. Unfortunately, it is necessary to note that this trend has led some professors in the Faculty of Engineering, to misunderstand this teaching methodology and use it to simply instruct students to complete the development of the class subjects and present them to the group, turning it into a convenient way to "teach the class". But the process of learning by doing research is far from this comfortable way of educating; it means to create and develop research activities to stimulate students' intellectual growth.

Salvador Malo [5] mentions that the mexican education system is perceived as inefficient due to the lack of innovation in the didactic strategies of the teaching and learning process and that the low quality of education can be attributed to the slow evolution that the teaching and learning methodologies have experienced, leading to an educational system with little success, with a level of teaching and research that is locally irrelevant. These are definitely harsh words, but it is the analysis of a professional who has spent years involved in the development of innovative educational programs for Mexican and Latin-American universities, such as the "Classroom Project" and "Innova Cesal".

3 METHODOLOGY

To strengthen the teaching-research binomial, the Faculty of Engineering has been recently hiring academics with master or doctorate degree, thing that used to happen only in research institutes. This trend has led to an increase in the number of RT, in which there is a need to develop research projects, multidisciplinary in many cases. At the beginning, projects were initiated with the teachers' own resources and through donations, including at all times the participation of students, who used the

results to develop their degree work. As for academics and researchers, they use the results of these projects to analyze and publish research articles, in which due credit is given to academics and students by including them as co-authors.

This method of linking teaching with research has continued to grow and the opportunities to accomplish federal funding for projects have been successful. The financial resources obtained from these projects has enabled us to provide scholarships to students participating in projects, the purchase laboratory equipment, materials for testing equipment and other supplies. The benefits are that 50% of students who have participated in such research projects have decided to study a postgraduate, others work in research centers and others work for the industry. Within this group of students there are those interested in making a career in research and those who prefer to develop in practice.

The development of research in the Faculty of Engineering has laid the groundwork for the creation of graduate programs, since it has the resources, academics, researchers and students who wish to continue their preparation. To date, they have diversified research issues and therefore, the development of scientific production within the institution is taking place. This is how the process of teaching has evolved, and activities are linking students in undergraduate and master's level, since a project can grow to large scale and include the participation of students from the two levels of study.

Now let us relate this teaching-research activity to a specific subject. One of the subjects where the authors have evaluated the results of this practice is the educational experience (EE) Mechanical Installations, which is taught to seventh semester students of the degree in Mechanical Engineering. Research activity and real troubleshooting, begins by assigning a specific topic that may be regarding the inspection of fire protection systems, gas systems, refrigeration and air conditioning, etc.

For this activity, students study mexican and international regulations on the type of facility where they will perform their research project and then, they analyze, based on the regulations, if they meet the requirements of the norm, generating a report, thus specifying the situation found in such systems, and making suggestions and recommendations. This activity allows students to delve into the world of research, and starting from the selection of the site for the project, the development and implementation of the report, which is reviewed by the academic for correction.

Finally, they deliver the report to the head of the company or establishment where the project was developed. This form of teaching-learning allows students to analyze the areas to be developed occupationally and foresee the topic to be developed for their degree. It also allows students to explore the practical world of work and the world in the field of analytical research, which often gives the basis for deciding to study a postgraduate.

In the example above, the subject belongs to the group of EEs of applied engineering, which in certain way makes it easier to link it with research activities, but not all subjects of engineering programs have that feature.

The other example given is the subject of Computer Programming, whose student coverage recently changed from one engineering program to the twelve engineering programs offered by the Faculty. In this case, the subject belongs to the group of EEs of basic sciences area, and is taught mostly to students enrolled in their second semester.

Apparently, for a course of this level, applied research has little relation to its subject matter, which includes among other things, learning problem solving methods using the computer, the development of computational algorithms, learning a programming language such as C and optionally, data file management. As part of the work strategy for this course, students are told from the beginning, to choose a topic related to their career, so they can develop a computer program that requires the manipulation of real data to generate value information as a result.

Most students find it interesting and they respond favorably with an attitude of enthusiasm for the subject throughout the course. The instructional design of the course involves the combination of exposure of concepts by the teacher in the traditional manner, working with computers in the classroom-laboratory, documentary research and the development of a computer programming project from its initial approach to completion.

Throughout the semester, students are supported with scaffolding tools, which consisting of study materials, selected readings, resolved exercises and bibliographic references. The evaluation criteria include exams, programming assignments, classroom-laboratory work, documentary research through the use of the Internet, attendance to classes and, of course, the final programming project.

The Universidad Veracruzana offers its Eminus2 web-based platform, to promote collaborative work on the Internet. Given this course is taught in a classroom-laboratory, the use of the Internet facilitates student access to online information. Professor additionally creates a group in the www.yahoogroups.com site in order to diversify the students' access to course materials that are distributed over the network.

4   RESULTS

Surveys were applied to students for the subject of Mechanical Installations for three consecutive years, from 2010 to 2012, about how they consider the way of teaching and learning through the development of research projects. The majority of students, 71% to 75%, consider this innovative way as "excellent", 29% to 25% of students consider this way of teaching as "good" and only 4% of students in 2010 considered this as "fair". These results show the good acceptance of this teaching and learning strategy. Fig. 1 shows these results.
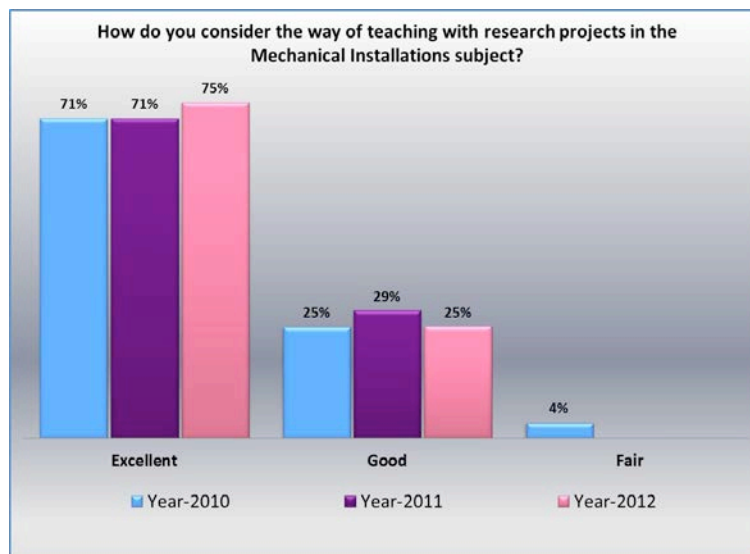

Fig. 1 Results of the survey applied to students of Mechanical Installations.

Fig 1 shows only the opinion of students on a specific EE, and one faculty, but, to understand the development of other research projects related to teaching, different forums are conducted at the Universidad Veracruzana, in which students show their research, namely, Vinculation Forum, Student Research Forum, UV Entrepreneur Forum, Forum of Educational Innovation and Graduate Colloquium.

The encouraging of the work of academics and students working together on research projects has allowed the growth of this activity and scientific production in our University. The faculty improvement program (PROMEP) allows academics to submit their projects for evaluation and obtain resources to implement them and get scholarships for their students. Another way to increase the research activity has been the development of RT. Fig 2 shows the evolution of the development of RTs in our Veracruz campus of the Universidad Veracruzana.

As for the subject of Computer Programming, the results of applying the criteria of the PA in terms of acceptance by students to research projects as part of their work throughout the course, can be viewed in the following graph. In general, students accept this kind of work with enthusiasm. Fig 3 shows these results.
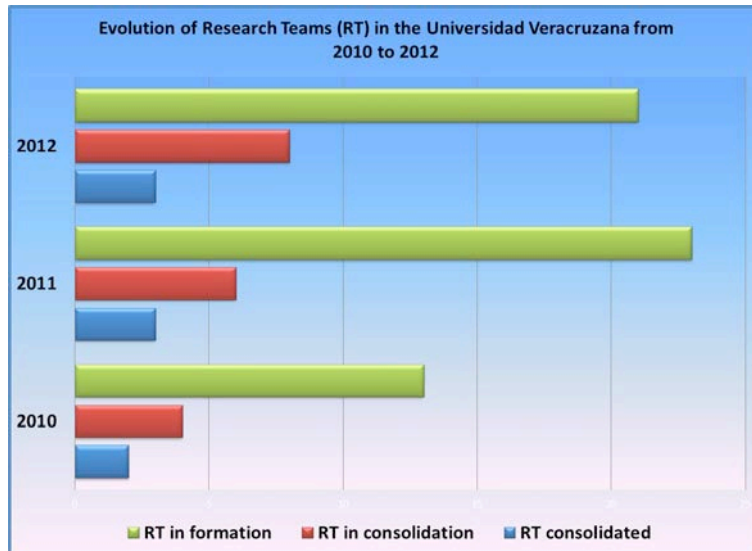
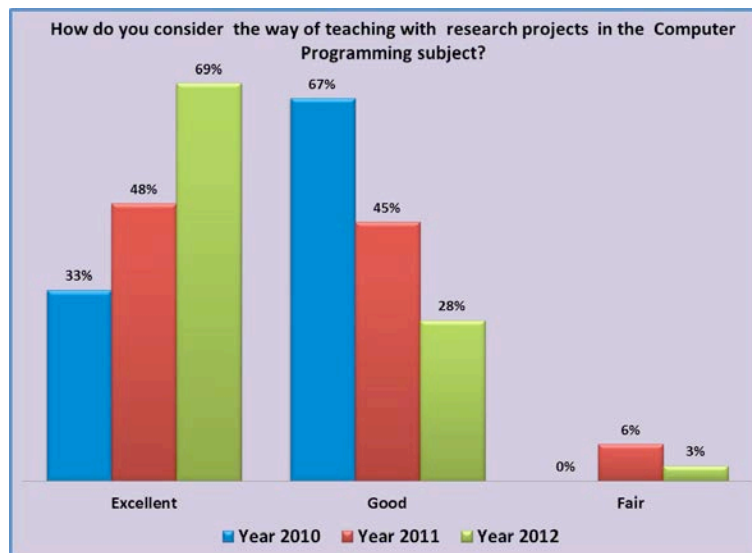Fig 2. Evolution of research teams RT in the UV from 2010 to 2012.

Fig 3. Acceptance of students of Computer Programming for research projects.

5   CONCLUSIONS

The continuous process of innovation in education in the Universidad Veracruzana has allowed it to climb steps and be ranked among the best in Mexico, achieving recognition for four consecutive years for its educational quality, granted by the Ministry of Education. Research has also increased in our institution, placing it in the top 15 out of 57 institutions; many researchers are members of the National System of Researchers. Postgraduate programs on offer are also mostly recognized as quality programs. So, staying ahead in educational innovation processes and promoting the development of research projects, will cause the benefits to be even greater for the academic and student community, thus strengthening the process of teaching and learning through research.

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