PARTICIPATION IN PROJECTS IN PROFESSIONAL TRAINING

G. Mata Hernández

Universidad Nacional Autónoma de México (MEXICO)

Abstract

Students’ participation and support in research, development, and teaching projects, is an activity that successfully contributes to train competitive engineers at national and international level. Professional training is not only confined to the curricular program, but also it’s strengthened with the collaboration of students in projects that, while it is not compulsory activity, it is widely promoted in various university programs. Thus, on the one hand, the students’ participation in research and development activities is promoted institutionally, and, on the other, students look and explore this alternative mainly in their last semesters, when choosing a modality to obtain their degrees.

Considering that within the University coexist diverse schools, centers and development and research institutes related to engineering, students take advantage of this opportunity to collaborate and acquire new responsibilities and professional competitiveness. At the same time, this option allows students to glimpse the professional environment and to join to other sectors of interest either at national or international level.

For this, there are various programs, projects, agreements, and institutional extracurricular activities aimed at the strengthening of capabilities and skills, allowing graduates to successfully manage their labour insertion.

This article describes the general characteristics of the programs and projects and their approaches, in which students can participate, ranging from teaching, technological development, research and productive sector projects, substantive functions at the UNAM. The analysis and experiences gained by the students as a result of their participation in projects, as part of their professional training, are presented, as well as some statistics derived from their participation.

1 INTRODUCTION

As part of the process of training engineers, professional practice allows the student to gradually join the activities of the professional field, in which case the University offers various options and strategic programs for developing capabilities for the qualified performance in the profession.

The Faculty of Engineering promotes that students approach to research, development, teaching and business creation activities through participating in institutional programs, University programs, as well as those linked to other external entities such as councils for science and technology. This demonstrates the importance and the need that the academic combines teaching activities with research and making the students to participate in these actions, which will contribute to their training, professional experience and a more expedite access to employment.

The experience indicates that participation in projects as a daily activity throughout the University, allows students to gradually acquire knowledge of the professional field in the University campus, getting skills and capabilities that facilitate their incorporation into the production environment at the end of their education, or providing training services to promote projects for the creation of enterprises and developing new business. Hence the importance of seeking alternatives that encourage continuous participation in projects.

The link between teaching and research and development projects allows, on the one hand, consolidating, strengthening and developing intellectual capital, promoting collaboration between disciplines and institutions; and on the other hand, manages the generation and renewal of scientific and technological knowledge that fulfils the different needs associated with engineering.

In this broad panorama of university programs associated to projects, the frame of reference corresponds to projects in five levels and specific approaches, in which academicians are responsible and students the participants.
2 FRAMEWORK FOR PROGRAMMES AND PROJECTS

The educational guidance projects under the Program of Projects Support for Innovation and Teaching Improvement of (PAPIME, initials in Spanish) are teaching-oriented projects that promote the improvement and development of academic staff through the support of projects that lead to innovation and improvement of the teaching-learning process that benefit students. Mainly, the involved academics and students are from Bachelor's degree level, although participation from other academic levels is allowed.

In technological development projects framed within the Program of Support for Research and Technological Innovation Projects (PAPIIT, initials in Spanish), participants are academics, undergraduate and graduate students. These programs are suitable to support and encourage the development of fundamental and applied research, technological innovation and formation of research groups.

Research projects within the framework of the National Council for Science and Technology (CONACYT, initials in Spanish), and the State Councils for Science and Technology with programs aimed at granting support for the growth and strengthening of the science, technology and innovation sector. Scholars and students, mainly from graduate level and to a lesser extent from Bachelor’s degree, participate.

Projects emanating from centers and institutes of the UNAM, aimed at research and development of the discipline, encouraging communication and inter institutional linking in terms of research and teaching purposes. Development of joint projects and training of human resources are stimulated.

Program of entrepreneurship of InnovaUNAM which supports a broader and more competitive formative offer so that members of the University community are able to design a traditional or technological business model to transform a detected business opportunity into an enterprise project. Likewise, it supports the construction of a business model so interested entrepreneurs have the skills needed to enter into the business incubation process at the InnovaUNAM Business Incubators System.

Figure 1 shows the scheme of projects and programs, both institutional and external, it indicates the level of academic training which are associated. Solid lines indicate direct channels of access and dashed lines indicate 'which can also be accessed from'. Participation begins with training projects throughout the career of study and, as students are advancing, they have the opportunity to know, identify and access them through the wide dissemination that is carried out at the Faculty, approaching academic leaders and participants, or by going directly to the corresponding programs.

Figure 1 Outline of programs and projects involving students as part of their training.
3 PROFESSIONAL EXPERIENCE ACQUIRED BY STUDENTS BY TAKING PART IN PROJECTS

The personal and professional life revolves around the development of projects, so that the greater the involvement of students in them, the easier access to the professional realm.

Participating in projects means to expand the vision of the engineering field and contribute to their comprehensive training. There are various general aspects in favor, from the point of view of the student:

− It strengthens the integral formation.
− It enriches the academic level and competitiveness.
− It extends the vision in the field of engineering.
− They are experiences that contribute to its incorporation into the professional life.
− It improves the ability to adapt.
− Learn different forms of collaboration.
− Expands the overview of what is a project.

Additionally, the particular aspects that contribute to their academic growth are broad and diverse:

• Training: Completion of thesis, participation in conferences, development of prototypes, etc.
• Personal growth: reaffirmation of values, integration of working teams, self-assessment, communication, …etc.
• Methodological development: comprehend, devise, analyse, synthesize, research...etc.

Participation in projects allows development of students’ talent through actions and learning strategies derived from the projects themselves, which lead to a development of technical, technological and social capabilities.

4 STUDENTS PARTICIPATION IN INSTITUTIONAL PROJECTS

As an example, figure 2 shows the record of institutional projects PAPIME and PAPIIT and the students’ participation of from 2009 to 2014-2016.

In the past 5 years, at the Faculty of Engineering 80 institutional projects have been developed on average per year and 278 students have participated on average per year.

An important task is to continue spreading and promoting projects and programs that contribute and strengthen the education of the students.

![Number of projects PAPIME and PAPIIT](image1)

![Number of students participating in projects PAPIME and PAPIIT](image2)

*Data not available

Figure 2 Number of projects and participation in PAPIME and PAPIIT [2], [3].
5 LEVEL OF COMPETITIVENESS IN PROJECTS

A rubric was designed as a tool for evaluating the achievements and progress derived from the participation in projects and it has been used in students’ and some professional pilot groups. It is still on a preliminary stage of application in broader sectors.

Skills, capabilities, and core competencies of each profile associated with participation in projects are described. It consists of 11 concepts and 4 levels of competitiveness: Starts training, In process, Reliable, Competent.

The level Starts Training is interpreted as the skills, characteristics, or minimum initial profile of the student-professional and the Competent one as a leader in their professional field.

The first two concepts are focused on student projects during their education, concepts 3 and 4 include experiences in institutional projects identified in Figure 1. The rest of the concepts are oriented to the total involvement in project management.

It is interesting to interpret the table as a structure of advancement channels, channels of opportunity or strengthening channels to acquire experience in project management.

Table 1 presents a basic profile of the student-professional focused on the participation and project management.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Starts Training</th>
<th>In process</th>
<th>Reliable</th>
<th>Competent</th>
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<tbody>
<tr>
<td>Definition and development of a</td>
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<td>student project</td>
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<td>Knowledge and application of the</td>
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<td>cycle of academic project</td>
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<td>Project Scope</td>
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<td>Time and Cost</td>
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<td>Human Resources</td>
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Table 1. Self-assessment of Competitiveness in projects.
**Communication and project’s stakeholders**

| Concept | Restricted to the work team | It identifies the main stakeholders and participates in the generation and reception of information | In terms of communication, identify those involved. It identifies potential problems, actively participates, and suggests solutions | Plan and control of the concepts. Identifies and applies management strategies with stakeholders. Ensures that the information is available, appropriate and timely |

**Quality in the Project**

| Quality includes | The delivery of product or service | It is known in general, it is applied and is assessed in terms of compliance of the requirements | The policies and procedures of the institution are known. Participates in the continuous improvement of processes | It is included in the planning, it is controlled, and meets standards for products and processes. It meets the expectations of the customer |

**Project’s Risks**

| It identifies basic risks | Understand the risks of the project and its management | Identifies timely information regarding risks. Knows indicators and implementation of objective measurement for identification of risks | They are planned, identified, analyzed, and controlled. Responses to risks are planned |

**Professional development of the project**

| It only participates and knows the project environment | Responsible for the execution of a short-range project under supervision | It knows the stages of the project and is responsible for it. Advice required to fully comply with the requirements of the project | Directs, knows, and has experience in the implementation of all stages of the project. Applies the knowledge, skills, tools, and techniques to meet the requirements |

**Complete Project Management**

| It requires supervision for managing a project | Minimum experience in project management | It manages and controls the execution of various projects | It manages and promotes new projects inside and outside of the institution |

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### 6 CONCLUSIONS

Participation in projects should be a continuous and daily activity in the academics’ and the students’ endeavors and as part of the training it is considered into the curriculum plan. In an extracurricular form, a first step to formally participate is through institutional projects such as PAPIME, PAPIIT, CONACYT, etc. Experience deriving from them makes it possible to open doors to other projects with other scopes, as well as way to link between disciplines and institutions and also gives the opportunity to venture into the professional sector.

The integration of projects in the processes of education strengthens the training of students and gives a guideline to encourage and instill in research and technological development. Moreover, projects are the motivation for initiating and training entrepreneurs in the Faculty of Engineering, because they require an interdisciplinary work team and allow the assessment of the quality of the participants’ academic education.

Knowledge and continuous exercise in project management are complex tasks that require time to achieve experience. Through participation in various university programs, students achieve a broader picture about professional projects and about the scope which they may have, facilitating the transition to the professional area.

It is important to foster and promote participation in projects throughout the academic years, and reinforce it at the end. Nonetheless, as it is an extracurricular activity, not all students participate.
REFERENCES


