

The Need to Strengthen Postgraduate Education in Argentine Surveying

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Key words: higher education, Doctor in Surveying, scarce resources, equality of opportunities.

SUMMARY

In Latin American universities, the European model for Doctoral studies has prevailed up to not so long ago. However, postgraduate education in Argentina does not consist only of doctoral studies but also, and in a decreasing order of complexity, of Master's degrees and diplomas, reflecting the incorporation from the 80's of the American model in the region.

In Argentina, these three levels of graduate education are ruled by the Higher Education National Act 24521/95, which also establishes that all postgraduate studies –be them diplomas, master's degrees or doctoral studies-, must be accredited by the National Commission of Evaluation and University Accreditation.

The Argentinean experience referred to postgraduate education in Surveying is very recent: the Surveying Doctorate from the National University of Catamarca, with its beginnings in the '90s, is the first and only academic top level offer in Argentina and Latin America, addressed exclusively to surveyors.

Since its creation, a total of 36 Argentinean, Brazilian, Uruguayan and Guatemalan students have applied for it, and although a significant percentage has abandoned or delayed their studies, four candidates have achieved the degree of Doctor in Surveying.

Difficulties observed unveil diverse aspects to be overcome, among them the insufficient support surveyors have had when starting postgraduate studies in an environment with scarce resources; besides deficient state financing, based on the criteria of self-financing in postgraduate careers. There is no doubt that the success of a national program with academic excellence and scientific and technological development, thoroughly planned and coordinated, depends on the harmonic union of three essential factors: human resources, infrastructure and financing, the first two depending much on the last one.

The challenge faced today by postgraduate education consists in obtaining equality of opportunities and in widening –in the short term- the horizon of highly-qualified human resources in order to strengthen research on Surveying and contributing for academic excellence. The fourth level, natural and necessary basis for the development of a coherent academic career, facilitates the shaping of a university culture that admits institutional evaluation, at the level of the institution as well as at the levels of its programs in teaching, research and extension to the community.

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1. ORIGIN AND EVOLUTION OF THE POSTGRADUATE EDUCATION DEGREE

Victor Morles (1992) points out that the postgraduate degree education was born in Germany in 1803, at the moment in which the University of Berlin was created, and the Doctorate was qualified as the highest degree a person can obtain by performing an individual scientific research work, under the supervision or guidance of a professor duly recognized because of his or her academic and scientific prestige.

During the Middle Ages, the degrees of Teacher, Doctor and Professor were awarded by some universities as an acknowledgment of the talent to teach or of the professional work developed by a university graduate.

Doctorates arose in XIX century Europe as a consequence of several factors: an emerging progressive bourgeois class, the growth of Capitalism as well as the development of the Industrial Revolution. Furthermore, it is also known that in Germany, Doctorates represented a reaction to clerical domination in the academic world. Thus, the new German University both scientific and liberal transformed the country into the intellectual center of the more advanced countries of the time. That is why, its highest title Doctor of Philosophy -PhD (Doctor of Philosophy) – was named as such to highlight the difference between it and the Doctorate of Theology that existed from medieval times. It was only in the XX century, that the highest academic degree awarded by the university, became the Doctorate of Sciences (Sc.D.).

As far as Latin American universities are concerned, the prevailing model of Doctorates until a short time ago, was the European one, generally conceived as the continuation of Licentiate studies. However, the current training as postgraduate degrees are concerned in Latin America, it is not only given by the Doctorates, but also, and in falling order of complexity, by the Master and the Diploma degrees, showing, in this way, the adoption of the American Model from the 80'. Thus, in Argentina, these three levels of postgraduate education are considered in the Higher Education National Act N° 24521 -passed in 1995-, that also establishes that all post graduate degree careers -namely diploma, master or doctorate - should be recognized as such by the National Commission of University Evaluation and Accreditation (CONEAU).

2. SURVEYING ENGINEERING AS A CAREER IN THE ARGENTINE EDUCATIONAL SYSTEM

The Federal Education Act N° 24195 passed in the year 1993 has fostered the complete reorganization of the Argentine educational system through the regulation of the different learning levels. According to its regulations, it is the State of the Nation the entity which establishes and controls the educational policies to follow in the strong belief that education

is a permanent process based on certain principles and criteria, such as the national identity strengthening, the consolidation of the democratic process in its representative, republican and federal form; the socio-cultural, scientific, technological development as well as the economic growth of the country; the agreement between the formal educational actions and the set of non formal activities offered by various sectors of society; the stimulus, promotion and support to educational innovations and the alternative educational schemas are also some of its main tenets.

Some authors have shown a clear tendency, as soon as the Act was passed, to an open, flexible and joint planning of curricular designs (Palladino, 1998). In this sense, it is the function of the Federal Council of Culture and Education - presided over by the National Education Minister, and integrated by the ministers of all the jurisdictions and a representative of the National Interuniversity Council (CIN) – to agree upon the common basic contents, the curricular designs, the evaluation criteria regarding the different cycles, levels and special frameworks that make up the system.

The Higher Education National Act N° 24521, approved in the year 1995, regulates the system of higher education in the national, provincial and municipal spheres, of university and non- university institutions which may be either public or private. This Act decrees that it is the State, the entity which is in charge of administering superior public education. Among the aims of superior education, leaving aside the ones established in Act N° 24.195, the following can be considered: to form scientists, professionals and technicians with a thorough knowledge in the subject together with a deep commitment with the society in which they are involved; to promote research development as well as artistic creations, contributing to the scientific, technological and cultural development of the Nation; to guarantee growing levels of quality and excellence in all the institutional alternatives offered by the system; to promote the appropriate diversification of superior level studies answering, in this way, to the population's needs as well as to the requirements of the cultural system and finally, to increase and to diversify the opportunities of updating and renewing the professional training among the members of the system and also of its graduates.

The academic and institutional autonomy set by the law, grants among other functions that of creating graduate and postgraduate careers, formulating and developing curricula both for learning and scientific research as well as for extension services to the community; granting academic and professional degrees in accordance with the conditions established in the law itself; and finally developing and participating in educational undertakings that may favour the advancement and application of knowledge.

Section 43 has introduced a new item: professions regulated by the State, for those whose enforcement necessarily commits the public interest by risking in a direct way the health, the security, the rights, the goods or the education of the population. They are specifically mentioned and restricted by the Ministry of Education and Culture along with the Council of Universities, as well as the definite activities -incumbencies – considered within each of these professional fields.

The curricula of those professions regulated by the State should respect the minimum time schedules drawn up by the Ministry of Education and Culture in agreement with the Council of Universities, as well as the requirements of observance of the basic curricular contents and the criteria to follow as regards the professional practice itself. Also, the career accreditation processes in charge of CONEAU or of acknowledged private entities constituted to that end must be enforced.

The Higher Education Act N° 24521 states in its complementary and temporary regulations (section 76) that those careers that - after requiring the accreditation process- cannot meet the established minimum standards, would have the registration of new students in the career suspended -when CONEAU recommends it -, until the deficiencies found are properly corrected.

In October 2002, the Ministry of Education of the Nation approved Regulation N° 1054, which includes in the list of section 43 of Act N° 24521 the degrees of Surveying Engineer and Industrial Engineer.

Amendment 4 of Regulation N° 1054 sets the standards for the accreditation process of the Career of Surveying Engineering establishes – among other aspects - that the teaching staff should have a university degree at least equivalent to the graduate degree provided by the career, and the full time teachers should prove postgraduate degree formation. Besides they should participate in research works, technological development, or innovative professional activities, to keep the methods and the results of the investigation and development duly updated and to ensure the continuity of the evolution in the different professional areas. Thus, the academic quality achievement is an unavoidably part of postgraduate degree studies which must be oriented to research.

3. EDUCATIONAL QUALITY AND POSTGRADUATE EDUCATION

Educational Quality appears as a relative and complex concept that takes for granted the idea of evaluating or assessing according to rules or preset standards. For that reason, it has been pointed out that the concept of quality when superior education is involved is a multidimensional one, which embraces all of its functions and activities. Therefore, its very nature demands and analysis of its component elements in order to reach a clear understanding.

The point seems to be that evaluation pursues the reflexive analysis of functions and activities in view of mechanisms leading to the institutional and academic improvement.

Wilson (1992) has related the teaching quality to the teachers' qualifications by defining it as the ability to put into practice the most appropriate curricula. His viewpoint stresses the importance to teachers' formation, not only in the teaching methods and techniques, but also in subject he/she deals with. Thus, the postgraduate degree formation in specific areas of Surveying, is nowadays presented in Argentina, as the cornerstone leading to the formation of scientists and academicians who may in turn, nurture research centers and university classrooms, with the ability to create new knowledge and new technologies, and to feedback

postgraduate degree education. And it is this fourth level, the natural and necessary base for the development of a coherent academic career, since it facilitates the formation of a university culture which allows institutional evaluation, not only at institutional level, but also as teaching programs, research and community services are concerned.

4. SURVEYING DOCTORATE AT THE NATIONAL UNIVERSITY OF CATAMARCA

The Argentine experience in postgraduate degree education in Surveying, is a recent one. In this way, the Surveying Doctorate of the National University of Catamarca, which began in the '90s, constitutes the first Doctorate in its type –and so far the only one - in Latin America, recognizing its antecedents in the German university programs of Surveying. This proposal of maximum academic level whose main objectives aim at deepening knowledge to reach excellent levels of training in the chosen specialty and to acquire scientific formation to drive with success investigations in surveying, it is exclusively directed to Surveying, Geographer Engineers, and Geophysical Engineers whose degree studies are equivalent to that of the career Engineering in Surveying of the National University of Catamarca.

The Doctorate of Surveying has been created under an Ordinance of the Superior Council N° 16 of October of the year 1989, and it has been granted Official recognition by Resolution N° 0552 the Ministry of Education of the Nation N° 0552 in the year 1999.

The Directive Council of the School of Technology and Applied Sciences [*Facultad de Tecnología y Ciencias Aplicadas*], passed the Resolution N° 19 under which it appointed the first Commission of Doctorate, constituted by University Professors Surveyors of acknowledged professional, academic and scientific prestige. These members were: Engineer Héctor Bernardo Oddone, Engineer Victor Hansjürgen Haar and Surveyor Tito Livio Racagni, as Regular Members, and Engineer Severiano Gustavo Bartaburu y Surveyor Bernardo Luis Toledo, as Substitute Members.

The need to drive forward the accreditation process of the fourth level and the investigation in the sciences of Surveying has been particularly considered when the National Commission of Schools of Surveying (CONEA) was constituted by the middle of the year 1997.

At the present time, the Commission of Doctorate is constituted by Engineer Víctor Hansjürgen Haar (Consultant Professor of the UNC), Engineer Gustavo Severiano Bartaburu (Professor Consults of the UNC) and Hilda Herrera Ph.D in Surveying (Regular Teacher of the UNCa), as Regular Members, and Antonio Introcaso Ph.D in Engineering and Engineer Bernardo Toledo (Extraordinary Professor of the UNSE), as Substitute Members.

The Commission of Doctorate plans, guides and supervises the activities concerning Doctorate Career in Surveying. Regulations state that, the members of the Commission of Doctorate should be or should have been university professors, they should also possess an academic title of the highest degree and have carried out a wide and recognizable scientific research work, or be specialists having an acknowledged career in a specific area of

knowledge in the field of surveying; besides, they should also show demonstrated capacity for the formation of graduates.

The Dean of the School of Technology and Applied Sciences states the annual schedule of the meetings of Commission of Doctorate, which has its current seat for both ordinary and plenary sessions at the School of Technology of Catamarca, the Department of Surveying of the School of Engineering and Natural Sciences of the National University of Córdoba, are also used as alternative seats, so that candidates can choose any according to their own needs to carry out their interviews with the Commission.

The institutional structure of the Doctorate includes an Academic Director that coordinates the activities of the career, and his main function consist in organizing the offer of graduate degree courses according to the specific branch of the different candidates for the degree -, to design the investigation programs that takes into account the inclusion of these candidates, to process the necessary resources to pay for the development of investigation programs, and to negotiate cooperation agreements with other institutions to enlarge the academic and scientific perspective horizons.

The duration of the Doctorate is variable, a 2 year-old minimum and a maximum of 5, so that each candidate accredits the cycles of both specialized and complementary formation and of complementary formation that will develop according to his own choice of courses in the specialized area, in different universities at home or abroad. The candidate should also pass an exam demonstrating his mastering of two foreign languages, and to write a Doctoral Thesis that means an original research contributing to a chosen field of knowledge humanistic, scientific or technological: the project for this theses should be approved by the Commission of Doctorate. Finally, the candidate defends his Thesis openly in front of a board of experts.

5. ARGENTINE EXPERIENCE IN FORMATION OF GRADUATE DEGREE IN SURVEYING

Since the creation of the Doctorate in Surveying, there has been a registration of 36 candidates coming from different countries of Latin American: Brazil, Uruguay and Guatemala. although a significant percentage abandoned or they deferred the program, four candidates have been awarded the Doctor's degree. Three of them reside in Argentina and the remaining one in Brazil.

The main difficulties that have blocked the continuity of the career reside in the lack of economic support for the development of and the shortage of economic resources that prevails about in the region. In this sense, the establishment of cooperation nets with other institutions having a higher degree of scientific and technological development.

On the other hand, our country did not have a system of intermediate formation between the Engineering in Surveying and its Doctorate. This situation led authorities to reorganize the design of postgraduate degree careers such as Diploma and Master degrees, as the Diploma in

Valuations and in Georeferencing that were created in 1996 by the National University of San Juan and the Master in Geomatics that implements the National University of La Plata.

Anyway, and it is fair to state it, an educational offer of postgraduate degree courses exists in the country that is not only dedicated to the graduate ones in Surveying, but it also includes a wide range of areas of interest embrace within the professional field, as the Doctorate of Geophysics implemented at the National University of Rosario that has already awarded this degree to two surveyors and likewise it should be pointed out that a reduced group of Surveyors has carried out or they are carrying out postgraduate degree studies at the moment in other countries.

Figure 1: ARGENTINA: Geographical Location of Postgraduate Degree Careers in Surveying



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Province of Catamarca: Surveying Doctorate – National University of Catamarca

Province of Buenos Aires: Master in Geomatics - National University of La Plata

Province of San Juan: Diploma in Valuation and Diploma in Georeferencing – National University of San Juan

6. FINAL CONSIDERATIONS

As of the last decade, some postgraduate degree proposals in areas of interest of the Surveying have been developed in Argentina, and although their history is very recent, they expect to meet the demands for highly qualified human resources in the profession, with growing participation in investigation so as to generate new knowledge and new technologies.

Nevertheless, the observed difficulties show different aspects that should still be overcome, as the scarce institutional support and the faulty financing based on the criterion of self-financing of the postgraduate degree careers.

There is not doubt that the success of a national program of academic, scientific and technological excellence, properly planned and coordinated mainly depends on the convergence of three essential factors: human resources, infrastructure and financing, the first two are highly dependent on the last one.

The present challenge facing the postgraduate degree formation in Surveying, consists in offering opportunities on equal terms with the aim of increasing the number of highly qualified human resources to secure the research in Surveying and feedback the postgraduate degree formation.

Roberto Ruiz Torrealba (1992) who was Academic authority of the University of Venezuela, affirms that when the own University strengthens the postgraduate degree formation, it begins to demand higher credentials for the entrance to the educational and investigation staff, this requirement contributes to the increase of the academic level and it allows the recovery of the normal academic circuits.

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BIOGRAPHICAL NOTES

Dr. **Analía I. Argerich** is a Surveyor Engineer graduated in 1986 from the School of Technology and Applied Sciences [*Facultad de Tecnología y Ciencias Aplicadas*], the National University of Catamarca [*Universidad Nacional de Catamarca*], Argentina. She holds a Diploma in University Teaching of Technological Disciplines from the School of Agricultural Sciences [*Facultad de Ciencias Agrarias*] the National University of Catamarca, Argentina, in agreement with the Central University of Las Villas, Cuba [*Universidad Central de Las Villas, Cuba*] (1999). She holds a PhD. degree from the National University of Catamarca, Argentina (2000) with the thesis “*Satellite images application in massive rural valuations*”. She is a Professor of “Physic Geography”, full-time from 1996, at the School of Technology and Applied Sciences of the National University of Catamarca. She is the Academic Director of the Surveying Doctorate Career, from 2002, at the National University of Catamarca (Argentina). She has published extensively in the areas of remote sensing applications and curriculum development in surveying.

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