

The Impact of an Internationalisation Programme in the Formation of Engineering Students

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Abstract—International mobility is a mechanism of internationalization that has an impact on all the substantive actions of higher education institutions and promotes the comprehensive training of undergraduate engineering students. The School of Mechanical and Electrical Engineering of the Universidad Autonoma de Nuevo Leon has been running an international mobility programme for more than 12 years. The programme was evaluated in order to assess the experience and the impact on the strengthening of the teaching-learning process of basic sciences. Results show that the internationalization programme has a positive appreciation by the students and their comprehensive training.

Keywords— *International mobility, higher education, internationalization, comprehensive training.*

I. INTRODUCTION

The internationalization is defined “as the process of the integration of an international, intercultural or global dimension into the purpose, functions or delivery of postsecondary education” (Knight, 2003). According to Gacel-Avila (2005), it refers to an international dimension, which provides from a group of conditions, such as the internationalization degree of its curriculum, the international profile of its scholars, the global competence of its graduates, and generally the international ethos of the institution. That is, it is related not only to the multiple forms of exchange and opportunities higher education institutions of the world provide, for sharing not only aspects of teaching experience and research, but also the formation of academic groups in foreign institutions, the encouragement of collaborative research, lecturers and students mobility, as well as working academic networks, as pointed out by Sittenfeld and Muñoz (2012). It is appropriate to consider the simple conceptualization of Gacel-Avila (2002), that is, by being internationalized; the university complies with its first priority, that is, universality.

Faced with the challenges of the global context, the Universidad Autonoma de Nuevo León (UANL) in its Vision 2020 presents as a priority the impulse and consolidation of the internationalization process through the innovative strategies which strengthen it as a world-class institution, acknowledged by its social commitment and the formation of schools of thought.

The School of Mechanical and Electrical Engineering (FIME) from the Universidad Autonoma de Nuevo Leon

(UANL) is an institution with more than 67 years’ experience. It has been accepted that one of the elements which applies a profound influence on the academic efficiency is a globalization. This phenomenon implies the conformation which does not distinguish borders and this process forms the most important challenge facing higher education. Several years ago the Unit of Higher Education (UHE) was undertaken as a process of internationalization for the purpose for generation of the equal participation conditions in the global knowledge society, and therefore to achieve the abilities strengthening not only of the society but also of the country because knowledge society the internationalization of higher education guarantees the quality of the education process.

FIME has developed the comprehensive training programme through the mechanism of internationalization. This programme has been implemented as a cross-cutting priority which influences all the activities of the UHE by means of policies and programmes developed and the implementation permitting the international character of the institution being integrated into the mission, purposes and functions. Moreover, this dynamic process transforms the institution and permits the UHE to be in the global field of knowledge, thus giving a better visibility and international recognition.

II. THE INTERNATIONALIZATION IN THE UNIT OF HIGHER EDUCATION

The core stone of the internationalization within the UHE during the last years was the focus on individuals, that is on the comprehensive training of the students where the international mobility positively impacts and promotes the mobility of academic personnel, contributing to the improvement of lecturing. Leading to positive impacts of the students training in situ; all this, without mentioning other important indicators of the internationalization.

It has been noted that during the last 12 years of the international mobility experience within the UHE, the students show the capacity of complex learning related to a range of intrinsic and extrinsic factors that condition the quality of the knowledge assimilation.

According to Torres and Alvarez (2006), the usage of the term “student comprehensive training” is becoming more and more frequent, although, it is ensured that lots of university

managers and professors are not familiar with its meaning, so the term becomes meaningless. Torres and Alvarez (2006) claim that higher education institutions have not understood that the future professionals should be not only more efficient within their professional areas but also should be competent as human beings. Torres and Alvarez say that the comprehensive training is a process by which students learn to explore themselves and the world around them, transform the world and achieve their self-education in different areas and action contexts which are demonstrated within the adequate coherence between feeling, thinking, saying and acting.

This project aims at highlighting the necessity of providing the UHE the analysis of learning of a particular sample of students which participated in the International Programme, considering the students as individuals that provide the information necessary for the effective administration of the comprehensive training, particularly in the case of the students which have international experience.

The mobility poses new situations and experiences on the students, such as new environments, new opportunities of intellectual development. This change creates learning potential for new knowledge. Moreover, during this process of learning other emotional, economic, cognitive and adaptive factors are also present. These aspects mark the footprint that impacts the students during the comprehensive training.

The Unit of Higher Education has maintained active partnership with the Institut National des Sciences Appliquées de Lyon (INSA), with a collaboration result of more than 12 years of cooperation. Examining this period of collaboration, it shows its contribution to strengthening of the academic aspects within the UHE.

1. The academic staff and students participation in the academic exchange through this cooperation contributes to the strengthening and development of the academic and intercultural structures of both institutions.
2. The collaboration with first-class institutions academic staff, like the Institut National des Sciences Appliquées de Lyon (INSA), brings the inherent improving to the profile of the UHE academic staff.
3. The partnership with the INSA represents a challenge and the consolidation of the Unit of Higher Education. Promoting the UHE to the highest levels of the comprehensive training.

III. EVALUATION OF THE INTERNATIONAL MOBILITY IMPACT AND THE BEGINNING OF AN INTERNATIONAL PROGRAM

By the year 2012 the international academic exchange programme of the FIME had 10 years of operation, the collaboration FIME-INSA was outlined as one of the most important; more than 500 students participated in this exchange. It was detected that students that participated in the programme before completing the first 3 years of their educational program faced difficulties in the field of basic

sciences, particularly solving mathematics and physics problems. Consequently a reorganization of the collaboration FIME-INSA in order to strengthen the basic sciences of the UHE was proposed. From the year 2012 a new model of exchange between these institutions was started.

For this new model The International Programme Euro-FIME was created. It consists on the active participation of academic staff and students in the development, improvement and evolution of educational programmes of international character, in order to adapt the needs and requirements of both institutions. With the experience of experts from both institutions and through the mobility and collaboration in research, the strengthening of the practice and the improvement of each of the participants and the institutions was obtained in natural way. This new academic scheme of teaching in the area of engineering is a result of the experience obtained during the running collaboration programme FIME-INSA.

Some of the results which were obtained from this analysis are the training of academic-researchers, bilateral exchanges of students, exchange of students supported by MEXFITEC (the cooperation programme Mexico-France, MEXico Francia Ingeniería TECnología), the participation of students in the programme Ingeniero Emprendedor of INSA, and the migration of the latter to the Unit of Higher Education, creating the program "Ingeniero Emprendedor" as a business incubator.

The structure of the International Program Euro-FIME includes the particular characteristics in attention to the areas of opportunity which were encountered during the analysis, such as extracurricular activities in mathematics and physics (basic sciences) in the UHE, in addition to the strengthening of the proficiency of the second and/or third language, in this case French.

IV. METHODOLOGY

This researching is participative and at the same time correlative, by virtue of the conditions and relations, dominates practice, believes, points of view and attitudes as far as the tendencies which develop and contribute to the comprehensive training of an engineer, based on the competence-based model.

In order to evaluate the effects of the international mobility programme and its influence in the teaching-learning process of basic sciences in engineering a comparative study, considering the participating students of the last 3 generations, was carried out. In this study the experience of the students during the preparation previous to the international stay to the return to the UHE was considered. In this manner the key variables involved were correlated.

A set of questions aimed at elucidating a general context and evaluating the impact of the international mobility was applied. Some questions considered aspects such as: generic competencies, technical skills, ability to adapt to new social conditions and cope with different educational models. Also factors related to the personal character, such as: maturity,

independency, self-confidence, self-assurance, and cultural sensitivity, ability to establish goals, professional engagement and ability to create new social nets. Regardless that this knowledge goes beyond the area of academic training it is very important for the comprehensive training of students.

The population of study considered was a group of 42 students (N=42). This group participated in the international mobility during the period of 2012-2014. The main characteristics are:

TABLE I. POPULATION OF THE STUDY.

	Men		Women	
	N	%	N	%
N=42	36	85.71	6	14.29
>20-24 y.o.	32	76.19	5	11.90
< 20 y.o.	5	13.89	0	0

A. Evaluation of the international experience.

Variables	Scale used
Generic competencies	1. A much lower level than the UHE
Technical skills	2. A lower level than the UHE
Ability to be adapted to new conditions	3. The same level with the UHE
Ability to be adapted to a new educational model	4. A higher level than the UHE 5. A much higher level than the UHE

B. The impact of the international experience within the student of engineering training.

Variables	Scale used
Maturity	1. A much lower level than the UHE 2. A lower level than the UHE 3. The same level with the UHE
Independence	
Self-confidence	
Self-assurance	4. A higher level than the UHE 5. A much higher level than the UHE
Cultural sensitivity	
Ability to establish goals	
Professional engagement	
Ability to create new social nets	

V. RESULTS

The following graphics show the results obtained. In the figures the Likert scale from 1 to 5 was used. In these results rating 1 indicates that the abilities of the recipient institutions were much lower than those of the Unit of Higher Education, and rating 5 that the required level was much higher. Therefore, the intermediate value 3 indicates that the students think that the abilities of both institutions are mostly at the same level.

According to Figure 1, the students consider their general knowledge, technical skills and the impact to the international experience at higher level than the level of the Unit of Higher Education, although, they admit that the ability to adaptation was the main challenge once they were in France.

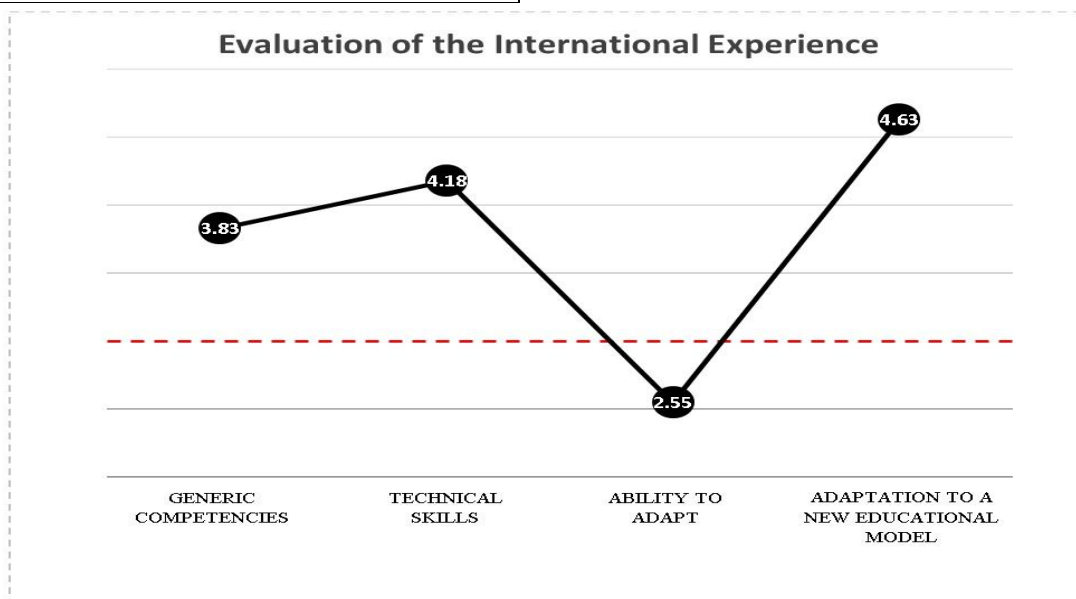


Figure 1. Evaluation of the International Experience.

In terms of the international experience within the student training, the results show that in spite of the fact that some of the students had some difficulties such as the adaptation to new a environment, different language, the independence which they had to develop, the cultural sensitivity, the ability

to adapt to a different system of teaching-learning and the capacity to create new social nets, they consider that the impact of this international experience was decisive for their comprehensive training, as it is shown in Figure 2.

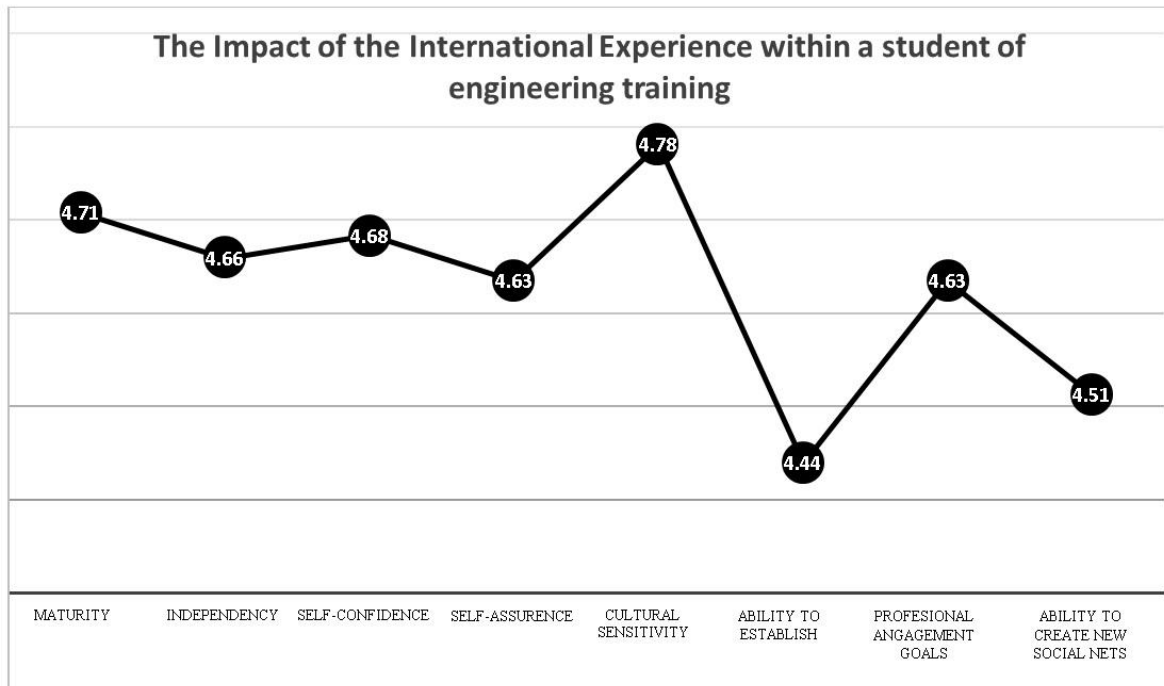


Figure 2. The impact of the International Experience within a student of engineering training.

The succes of the exercise was demonstrated by the academic results of the students in the foreing institution.

VI. CONCLUSIONS.

In general, with regards to the training benefits of the development of generic competencies, linguistic, cultural and subject knowledge, it was shown by the respondent students that the impact in their training was perceived as positive.

The results of the survey show that the most cited challenging factor was the ability to adapt. The replies of the survey referred to the necessity of integration in a different culture and another teaching-learning system. That is, for some of the students the situation of living along without the support of their families and friend was not easy to face it.

The necessity of cultural integration which is not only the adaptation to the standards of behaviour and rules of the recipient institution but also the adaptation to a new cultural environment resulted that some of the participants had difficulties to accomplish the strict academic requirements which had distinct teaching-learning methods and its correspondent linguistic set-up.

For our students the international experience seems to be a relevant component of their education not only because of the advantage of the bilingual skills but also because of the opportunity of having life and training

experience of international character. Thus, it is evident that students in an international programme expect to receive differentiated training. Students understand that this option gives them a broader education panorama than that they would obtain from the institution of origin.

Possible way forward for the improvement of the international program.

The framework that stands out for the analysis of the questions which presented the greater difficulty for the participants of international mobility is related to the ability of adaptation to a new environment which includes the academic field.

There is not large difference in the assessment of the students (in average it is 2.55 showing that the difficulties in the adaptation were not beyond solution, but they were the result of a new experience related to independency and autonomy). Large periods of staying out of their common environment generated some problems of communication, managing resources, cultural shock and in some cases a sense of nostalgia but without any extreme problems in the analysed cases.

In the group of study it is appreciated that being far from their families and friends, that is, far from the familiar environment, the willingness to overcome this kind of problems, like cultural difference, permits to develop self-confidence, have more assurance and independency, generate a higher level of cultural sensitivity improving the capacity of creating new social nets, and therefore, to

improve the ability to set goals and to engage professionally that is to strength their Career/Life Planning.

Another result of the research shows that the international programme permits the students feel more satisfied with their comprehensive training in terms of participation in the international mobility since they perceive themselves as more matured in comparison with their initial profile before this experience.

As for the academic development, the results confirm that as a consequence of overcoming of academic and cultural challenges which were faced in the host institution, the students feel better prepared and so, consider the impact of the programme to their academic progress as positive.

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REFERENCES

Beelen, J. (2011). "La internacionalización en casa en una perspectiva global: un estudio crítico del Informe del 3.er Estudio Global de la AIU". En: "Globalización e internacionalización de la educación superior" [monográfico en línea]. Revista de Universidad y Sociedad del Conocimiento (RUSC). Vol. 8, n.º 2, págs. 85-100. UOC. Consultado en <http://rusc.uoc.edu/ojs/index.php/rusc/article/view/v8n2-beelen/v8n2-beelen>

Fresán, M. (2009). "Impacto del programa de movilidad académica en la formación integral de los alumnos". Revista de la Educación Superior Vol. XXXVIII, págs. 141-160.

Gacel-Avila, J. (2005) "La internacionalización de la Educación Superior en América Latina: El caso de México", consultado a través de <http://cie.uprrp.edu/cuaderno/ediciones/19/pdfcuaderno19/c19art6.pdf>

Gacel-Avila, J. (2002) "La dimensión internacional de las universidades mexicanas: Un diagnóstico cuantitativo y cualitativo". En: Educación Global. Guadalajara, México: AMPEL.

Knight, J. (2003) "Updating the Definition of Internationalization", consultado a través de http://www.bc.edu/content/dam/files/research_sites/cihe/pdf/IHEpdfs/ihe33.pdf

Sittenfeld, A. y Muñoz M. (2012) "El componente de la internacionalización en el régimen académico de la Universidad de Costa Rica", consultado a través de <http://revista.inie.ucr.ac.cr/ediciones/controlador/Article/accion/show/articulo/el-componente-de-la-internacionalizacion-en-el-regimen-academico-de-la-universidad-de-costa-rica.html>

Torres, A. y Alvarez, N. (2006) "Un modelo pedagógico para la autotransformación integral del estudiante universitario. En: Tendencias Pedagógicas.

UANL (2012). Visión 2020 de la Universidad Autónoma de Nuevo León.

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