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# The Internationalization of Engineering Programs and Its Contribution for Minas Gerais Universities: An Evaluation of UEMG

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**Abstract**

In view of globalization, the internationalization is seen as an articulating instrument between the international and intercultural dimensions, becoming really essential, as institutions and the market currently require more and more qualified professionals. In this context, especially with regard to Engineering, both professors and students are searching for new forms of teaching and learning, mainly outside the country, showing interest in being in contact with renowned technological Universities around the world. The implementation of academic mobility programs such as Science without Borders (CsF) have reinforced discussions about the importance of a borderless training for the Engineer, considering the professional capability of innovating, absorbing technology and transforming it into material progress for the benefit of society. In this sense, this work aims to measure and emphasize the importance of this program for Minas Gerais Universities, focusing on the performance evaluation of UEMG Engineering campus. With the help of the CsF Portal and support of the UEMG International Relations Advisory, it was possible to collect general data about the program and find the number of students which were contemplated with CsF scholarships in the four different Engineering courses of UEMG from 2011 to 2016. In addition, it was assessed the qualitative factors of the program pointed out by the students itself. The results demonstrated that Engineering was the most requested area by CsF and that Minas Gerais Universities presented great potential in receiving scholarships. In a closer evaluation of the UEMG, it was observed a disparity regarding the distribution of scholarships between the Engineering courses, highlighting the Mining Engineering course compared with the others. However, it should be noted that this program was very important for all, since it has allowed students to acquire more and new knowledge in specific fields of their courses, improve another language, experience new cultures as well as learn new methodologies of teaching and assessment, such techniques that they can bring into their Engineering programs in Brazil.

***Keywords:*** Science Without Borders, Education, Engineering, Internationalization, UEMG.

# 1. Introduction

Globalization brings with it a new perception of the world, supported by social, cultural, technological and even educational advances. Brazil has experienced the strength of this progress in the last decade and how it has contributed to the creation of an important and challenging scenario, putting the nation in evidence in the world[1]. These changes directly affect the Higher Education Institutions (HEI), the main suppliers of skilled professionals for the country.

In view of this, it was observed the need for the internationalization of Higher Education in Brazil, mainly in Science, Engineering and its Technologies. According to Aveiro, the process of internationalization of Higher Education, which encompasses undergraduate and postgraduate studies, is extremely important to guarantee the excellence of Universities and generate development of the country[2]. Thus, signing agreements with foreign Universities is fundamental to the interaction and integration among students, teachers and researchers around the world.

This internationalization, a movement that is already common in Europe and North America, has grown significantly in Latin America in recent years[3]. In Brazil, there has been a great increase in the opportunities for students and researchers to participate in international exchange programs such as Santander Universities, Erasmus Mundus, Orange Tulip, Brafitec and Sciences without Borders (CsF), the latter the most featured in the current scenario. The studies carried out by Gonçalves et al., showed that students from

Minas Gerais had a great potential in achieve CsF's scholarships and that the program was the key to personal and professional changes[4].

In this sense, the Science without Borders (CsF) program was created to promote student's mobility by offering academic and scientific exchange in renowned international Universities, placing Brazilian students in the face of innovation, competitiveness and entrepreneurship from developed countries. This important nationwide program, instituted through Decree 7,642/2011, is a joint effort of the Ministry of Science, Technology and Innovation (MCTI) and the Ministry of Education (MEC), through its institutions National Council for Scientific and Technological Development (CNPq) and Coordination of Superior Level Staff Improvement (Capes), as well as by the Secretariats of Higher Education and Technological Teaching of the MEC[5].

Considering the current changes due to this globalization in Higher Education, this research aims to show the important role that student mobility programs have in the internationalization process of Engineering programs from Minas Gerais Universities, analysing more closely the UEMG Engineering campus, located in João Monlevade.

## 2. Science Without Borders and the Engineering

The Science without Borders program was created to increase the potential of Brazilian graduates and undergraduates, given the accelerated technological changes that have taken place in recent years. In this way, the government created a bridge between the students and the international teaching centers aiming to acquire new knowledge and qualify the student's workforce, which are the future professionals of the nation.

Such policies were necessary due to some difficulties detected in the strategic sector, mainly in Engineering, owing the large and complex projects that the country faced in recent years both in public and private areas, for example, related to the necessary infrastructure for the 2014 World Cup and the 2016 Olympics which were based in Brazil.

In light of this, the significant advance of the internationalization of students in Engineering can be verified by the information in Table 1, which shows the distribution of scholarships implemented in Engineering and its Technological areas in relation to the other areas contemplated by the Science without Borders, with data updated until January 2016.

Table 1. Distribution of scholarships implemented by priority area[6].

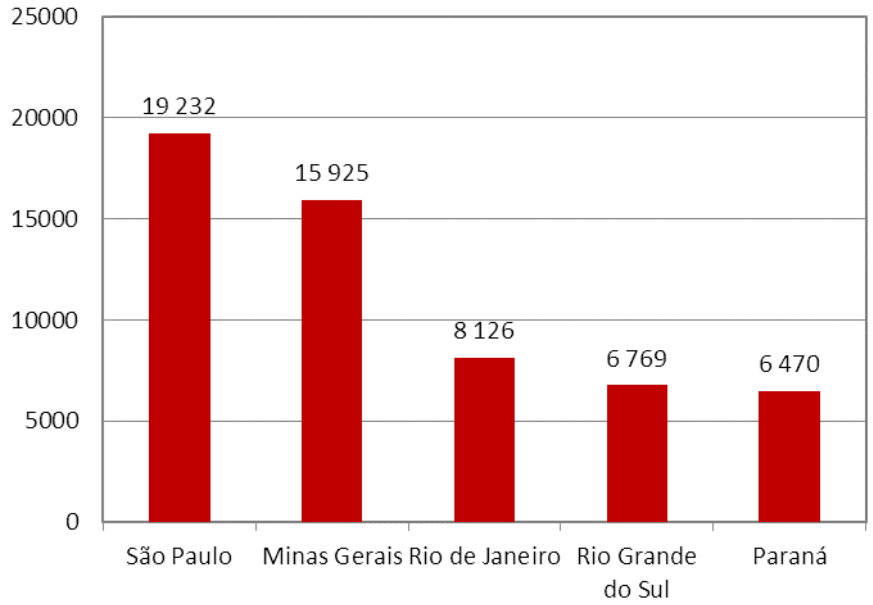
| Priority Areas | Number of Scholarships |
|---|---|
| Engineering and its Technological areas | 41,594 |
| Biology, Biomedical and Health Sciences | 16,076 |
| Creative Industry | 8,061 |
| Earth Sciences | 7,361 |
| Computing and Information Technology | 5,694 |
| Sustainable Agricultural Production | 3,197 |
| Biotechnology | 2,039 |
| Pharmacology | 1,879 |
| Biodiversity and Bioprospecting | 1,342 |
| Renewable Energy | 1,000 |
| Uninformed | 873 |
| Nanotechnology and New Materials | 697 |
| Oil, Gas and Mineral Coal | 678 |
| New Constructive Engineering Technologies | 566 |
| Aerospace Technology | 431 |

| | |
|---|---|
| Technologies of Prevention and Mitigation of Natural Disasters | 260 |
| Training of Technologists | 183 |
| Mineral Technology | 136 |
| Total | 92,880 |

According to the Control Panel of the CsF Program above, the total of 92,880 scholarships were distributed by January 2016 for all modalities of exchange, which 77.9 % of this total was destined for undergraduation mobility and the remaining 22.1 % for postgraduate studies[6]. It can be verified that Engineering and its Technological areas were the field that received the largest number of scholarships with 41,594, showing the importance of this area for the country progress especially in Infrastructure Enlargement, Quality of Services and Management of Economics and Environment.

Through the Portal it is also possible to identify the number of scholarships contemplated by each Brazilian state as shown in the Graphic 1.

Minas Gerais was the second most receiving state with 15,925 scholarships, what is equivalent to 13 % of the total. This fact shows the potential of Minas Gerais Universities in the acquisition of scholarships, mainly because its students who have demonstrated excellent requirements for the program as well as due to the quality of teaching and policies focused on international relations.




Graphic 1. Distribution of the number of scholarships according to the five most contemplated Brazilian states by the Science without Borders program.

# 3. Methodology

The analysis of this article was made in a descriptive and exploratory way. Firstly, this research deals with the fundamental process of internationalization of Higher Education in Brazil with a focus on Engineering and its Technologies, regarding their contributions to the improvement of Engineering programs and professional qualification of students.

Subsequently, in order to evaluate the performance of the UEMG Engineering Campus (João Monlevade Campus) in the Science without Borders program, data were collected with the support of the International Relations Advisory on the number of students enrolled in the academic exchange by the CsF program in the four Engineering courses present at UEMG (Civil Engineering, Environmental Engineering, Metallurgical Engineering and Mining Engineering) from 2011 until the beginning of 2016.

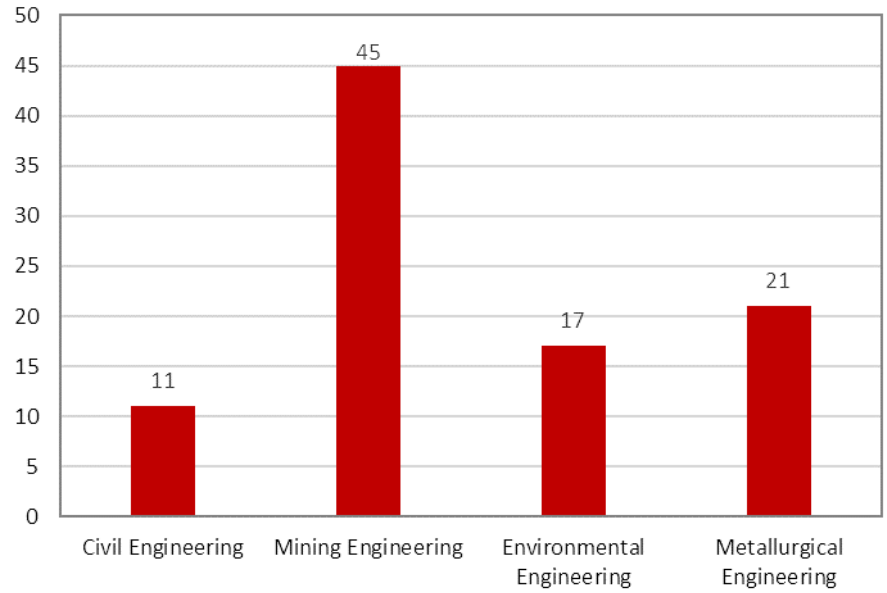
Then, an open questionnaire, which according to Mattar brings advantages as the stimulus to cooperation and potentially covers points beyond the closed questions[7], was applied to UEMG students who have already participated in the CsF for qualitative evaluation of the program. Each student was asked about the main strengths of the program and how they affected their post-program career.

# 4. Result Analysis

Graphic 2 shows the distribution of scholarships per course for UEMG (João Monlevade Campus). From the chart it can be observed that the number of scholarships awarded between the four Engineering courses is not equivalent, especially the Mining Engineering course with almost 48 % of the total. Such disparity indicates a differentiation in the courses policies, especially with regard to the professor's encouragement in apply the program, greater preparation of students to meet the excellence requirements and English language preparation.

Although the total number of students participating in the CsF program is considered low, it is important to emphasize the fundamental role of this exchange for UEMG. Such mobility has brought benefits to the study programs in which these students are inserted, allowing a favorable environment for experiences exchange and maturation of Engineering programs of João Monlevade Campus. A concrete fact that shows this is the increase in the number of international bibliographies used in academic papers, more articles accepted in international journals and the creation of extension projects aimed at the English education.

The questionnaire applied to the CsF ex-participants helped to identify the program's key qualitative points for the student and professional career of the future Engineers. Among the most cited points are the acquisitions of proficiency in another language, new knowledge in specific subjects of the course, possibility of internship and research, experiencing new cultures and places, increased networking and employment opportunity in Brazil. Such contributions are essential for the training and professional qualification of Engineering undergraduates. Finally, the potential of these programs such as Science without Borders goes beyond strengthening ties with international Universities, they enable the transformation and improvement of Engineering programs in Brazil due to all the experience that these alumni can bring into their courses, especially with regard to Scientific research, new specific knowledge and assessment methodologies.




Graphic 2. Number of students participating in the CsF program according to each Engineering course at UEMG (João Monlevade Campus).

## 5. Conclusions

Mobility programs are very important for the personal and professional growth of students, given the possibility of contact with new cultures and innovative technological centers. Minas Gerais Universities have shown big potential in sending its graduates overseas and this represents an important role for the internationalization of students and the Engineering programs when they return.

Indeed, the participation in an academic exchange in the area of Engineering, in his theory, results in several benefits to the students. Among them, it is possible to highlight the possibility of access to innovative environments, where the Engineering students have the opportunity to study, carry out research and/or internship, transferring to them advanced forms of work and greater technical-scientific knowledge. In addition, such mobility not only brings benefits to the individuals involved, but also to the study programs in which they are inserted, allowing a favorable environment for exchange of experiences and maturation of Engineering courses in Brazil. The experience as a whole makes the students develop a more critical and humanized thinking of their professional role as an Engineer.

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