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The importance of Collaborative work among Countries in Engineering Education

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Abstract

A comparative analysis based upon recent international conferences held in Brazil shows that many opportunities have been created among researchers and teachers mainly in engineering and technology fields of exchange and cooperative projects with others from other Countries. The obtained results are partial and may not be conclusive but they show the willing of scientific and technological community to foster Engineering Education in the Country. The educational policy of Brazilian government has played a decisive part in all these enterprises as well as educational organizations and societies both national and international.

1. Introduction

In recent years Brazil has inserted into international educational communities both in North America and in Europe. The growth of quality level of Brazilian engineering standards of education became an objective reality. Its active participation in the work of various conferences and societies all over the world has considerably enhanced old educational traditions and formed a new generation of young engineers capable to resolve many acute problems of Brazil's national economy in the most efficient way. In many aspects this success is supported by a series of recent conferences intended to increase the role of national engineering education and to attract the recognized international organizations and institutions for mutually beneficial cooperation. The educational policy of Brazilian government has played a decisive part in all these enterprises. The stability of the steady gradual rise of engineering education quality in Brazil is in many aspects caused by organizing regular international conferences where all vital and important problems of engineering education are being discussed in utmost open and lively atmosphere. Theoretical and practical issues are considered in sessions and workshops intended to give an immediate vocational training to young Brazilian educators participating in the event. In their turn, the young professors are eager for applying their newly acquired educative ideas and innovative initiatives to their local universities; and the regular conferences with a participation of recognized educators from foreign and national technical universities give a good basis for that.

Brazil has been present in international educational communities not only in North America but also in Europe and the growth of quality level of Brazilian engineering standards of education became an objective reality in recent years [1-3]. It is due partly to the active participation in the work of various conferences and societies all over the world that has considerably enhanced old educational traditions and formed a new generation of young engineers capable to resolve many acute problems of Brazil's national economy in the most efficient way. In some ways the success is supported by a series of conferences with the goal to increase the role of national engineering education and to attract the recognized international organizations and institutions for mutually beneficial cooperation. The educational policy of Brazilian government has played a decisive part in all these enterprises [4-6].

The results of the present analysis are partial and may not be conclusive but they can indicate the present willing of scientific and technological community to foster Engineering Education discussions as well as to show the growth of initiatives to pursue the betterment of it and the successful achievements. Many Universities and their researchers can show their achievements not only technological but also educational promoting the Superior Education in the Country an issue that despite some efforts is still weak under the point of view of scientific and technological development of a Country. The educational policy of Brazilian government has played a decisive part in all these enterprises as well as educational organizations and societies both national and international like ASEE, IEEE, SEFI, ASIBEL, IGIP and others. It is an activity that has been also promoting the international cooperation between Brazilian educational institutions and international ones generating new projects in partnership.

2. Conferences in numbers

In many ways it can be said that the gradual rise of engineering education quality in Brazil is caused by the organization of regular international conferences where all vital and important problems of engineering education are being discussed in utmost open and lively atmosphere. Theoretical and practical issues are considered in sessions and workshops intended to give an immediate vocational training to young Brazilian educators participating in the event. In their turn, the young professors are eager for applying their newly acquired educative ideas and innovative initiatives to their local universities; and the regular conferences with a participation of recognized educators from foreign and national technical universities give a good basis for that. Six important conferences on engineering education took place in last years:

- 1999: International Conference on Engineering and Computer Education (ICECE'99), Rio de Janeiro, August 11-14;
- 2000: International Conference on Engineering and Computer Education (ICECE'2000), Sao Paulo, August 27-30;
- 2002: International Conference on Engineering and Technology Education (INTERTECH'2002), Santos, March 17-20;
- 2003: International Conference on Engineering and Technology Education (ICECE'2003), São Vicente, March 16-19;
- 2004: World Congress on Engineering and Technology Education (WCETE'2004), Guarujá, March 14-17.
- 2005: Global Congress on Engineering and Technology Education (GCETE'2005), Bertioga/Santos, March 14-19.

Another international conference on engineering education has been scheduled for 2006 in Itanhaém (WCCSETE'06: World Congress on Computer Science, Engineering and Technology Education). The period (final of summer and beginning of autumn in Brazil) is the one that has been showing the most favorable because it is not so warm but it is still possible to enjoy the excellent climate of Brazil.

A comparative analysis has been elaborated to demonstrate the undoubted success and progress of these events as well as their influence on formation of young engineers. The analysis utilizes the dates of the six conferences that have already happened.

Below there is a list of main supporters of conferences that includes both recognized international and Brazilian organizations, which demonstrated their great interest to these events. The conferences count with the Technical Cooperation of:

- IEEE (Institute of Electrical and Electronics Engineers);
- ASEE (American Society for Engineering Education);
- IGIP (International Society for Engineering Education);
- SEFI (European Society for Engineering Education);
- INTERTECH (Interamerican Council for Engineering and Technology Education);
- ASIBEI (Iberian-American Association of Engineering Education Institutions);
- ABENGE (Brazilian Society for Engineering Education);
- RBE (Brazilian Network of Engineering);
- NBPAS (Brazilian Nucleus of Environmental Researches and Health).

These conferences have as sponsor the largest Brazilian Agency for Development of Science like:

- CNPq (National Council for Scientific and Technological Development);
- FAPESP (State of São Paulo Research Foundation);
- CAPES (Coordination for Improvement of Personnel of Superior Level).

And also some Brazilian enterprises like Petrobras the largest petroleum company of Latin America and other local ones.

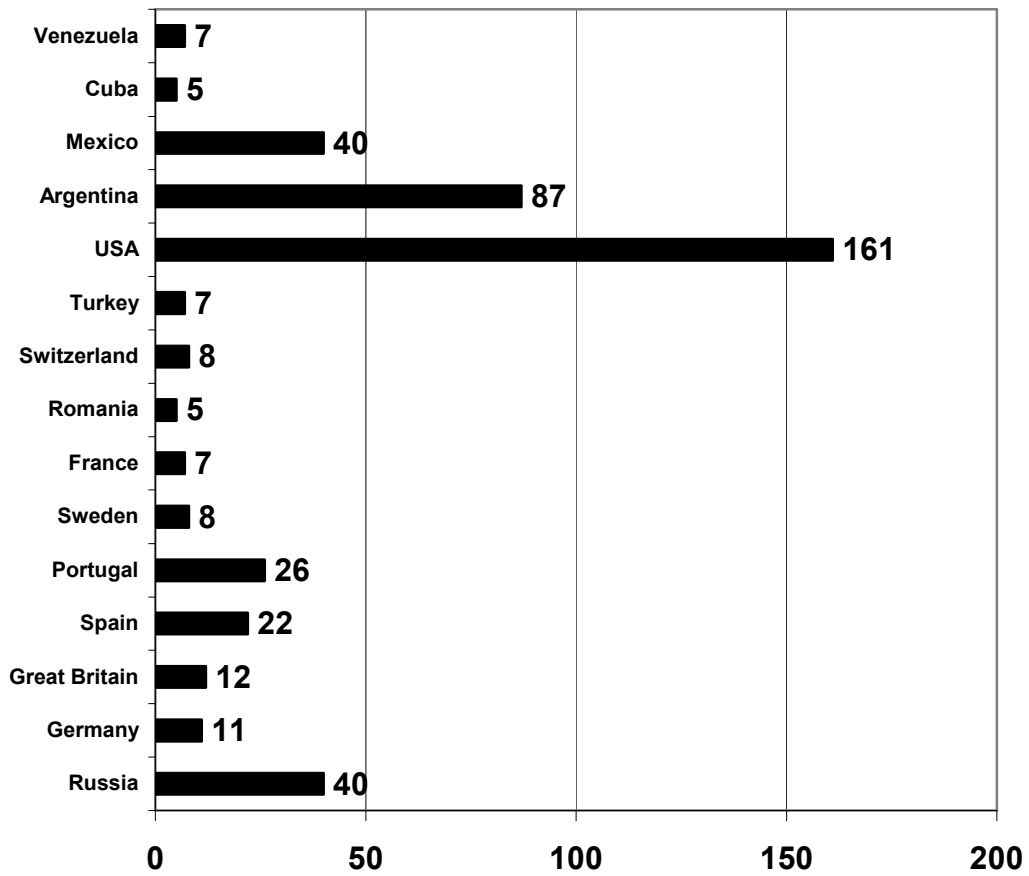
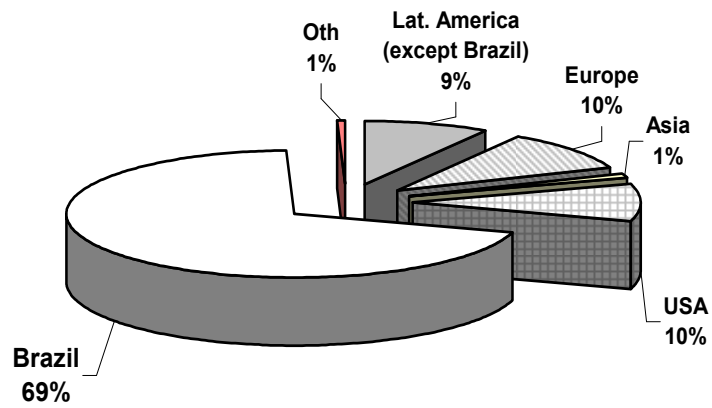


Fig. 1. Overall participation in six conferences (top) and most active participants (bottom)

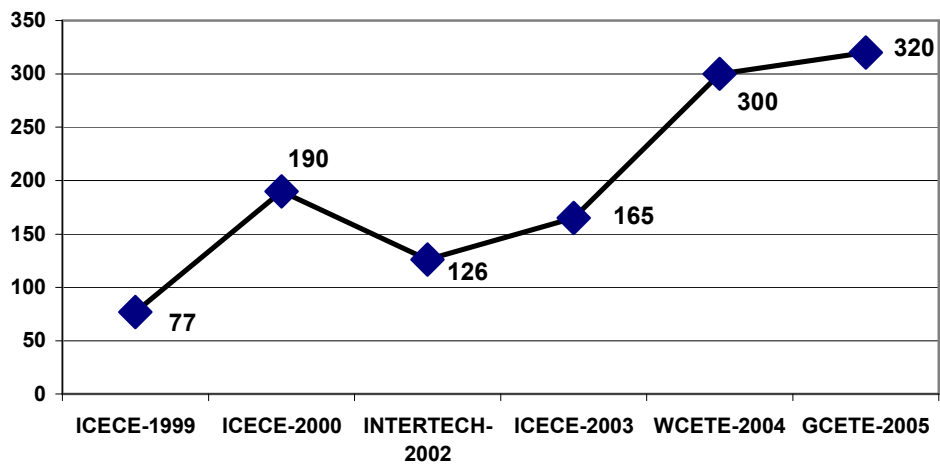
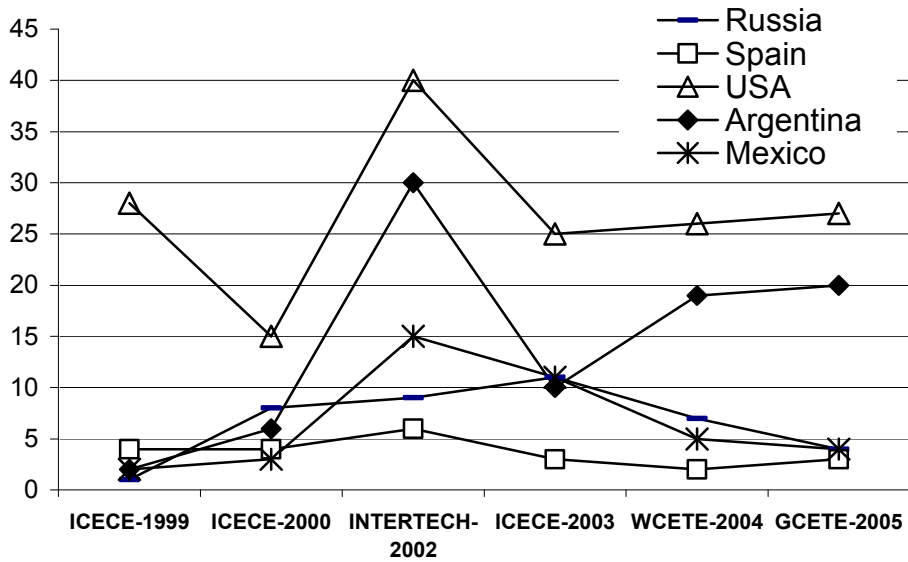


Fig. 2. Participation of Brazil (bottom) and some foreign countries (top) in six conferences

Fig.1 that shows the overall global involvement into Brazilian conferences (nearly 1700 participants) that is illustrated on the total number of foreign papers presented at six conferences. The Figure reflects the countries that presented not less than five papers at six conferences. The percentage of “continental” participation is shown on a pie-diagram at the top of Fig.1. As one can see, Brazil, of course, is the chief contributor (1178 papers submitted).

Fig. 2 (top) shows the contribution of foreign countries (number of papers) and also Brazil's contribution is clearly seen from the bottom diagram of the same figure. It is important to underline that Brazilian contributors really present the whole large country: from Rio and Sao Paulo to its most distant regions. These results are very promising and could only be achieved under a constant and steady attention of Brazilian government at all levels of the national education where the engineering education is definitely a priority. The states of Rio de Janeiro and Sao Paulo with the largest concentration of best universities were successfully selected as centers for international forums.

It seems that there are three main reasons to make a very favorable ground for further successes in this area:

1. There works a very efficient system CAPES, which coordinates the means to improve the level of the personnel responsible for higher education. Practically, CAPES bears responsibility for all post-diploma education and the quality of the corresponding academic curricula. Besides, CAPES is involved into broadening of the international cooperation and providing young students with scholarship to their education in Brazil or abroad.
2. Strong control of the quality of higher education realized owing to two important factors:
 - General National final examination to receive a diploma of higher education. This examination is considered as obligatory.
 - Program of Institutional Evaluation of Brazilian Universities (PAIUB). The evaluation embraces all the aspects of a university life on a voluntary basis.
3. General progress of engineering in Brazil and a prestigious status of engineer as a specialist.

All these three aspects taken as a whole make the engineering education in Brazil very efficient and promising for young people [7]; and a tendency to organize international conferences on engineering education puts Brazil forwards to one of leading positions in this area.

Another aspect that has to be taken into account are the new policies that are rising in the country especially in the Atlantic Coast Region of São Paulo state where the recent efforts are focused on the fostering of a whole year business tourism.

3. Conclusion

The Brazilian science has several challenges: to enlarge the system with quality, supporting the installed competence; to transfer knowledge of the research section for the industry; to base government's actions in strategic areas; to deepen the evaluation of the existent programs and to begin innovative projects in areas of relevance to the Country. On the other hand, the scientific popularization has a fundamental paper to transform the great public's perception on the importance of the science in the modern life. All these new activities and these new challenges are being approached actively at the Country starting from the institutional base and of the existent scientists' performance.

The work shows a comparative analysis based upon five recent international conferences on engineering education, which obtained data exposed that the conferences have been a success.

They can contribute to the dynamic discussions of engineering education in Brazil once they bring what has been done abroad and what has been done in the country. New local policies will provide a better support for this level of conferences once it brings to the Atlantic Coast Region of São Paulo the international tourism that also cooperates to maintenance of jobs and rising of local economy. Although it is a small number of conferences in this particular area the rising number of participants shows that it has a future. Besides it is an important index of possibilities for other conferences in other areas.

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