Cooperative Education: a proposition to increase the number of admittances of students into the Brazilian public higher education institutions

Patricia Helena Lara dos Santos Matai[1], Shigueharu Matai[2]

Abstract **- The Brazilian Education Ministry has presented a preliminary version of a project that proposes the increase of the number of admittances of students into the public higher education institutions. An education model largely practiced in Canada appears as a suitable model to increase the number of admissions of students. According to that model, the students have to accomplish nine Academic Terms at the university and six Work Terms (Internship programs) in public and private companies, in different departments of a same corporation, in social projects, in research institutes, in other cities and countries. They represent very good opportunities for the students as they are exposed to cultures other than their own reality. The model establishes an effective interaction between the university and local and overseas corporations. This paper presents and discusses how the university resources can be efficiently employed to fit the suggested Cooperative education model as well as its advantages when applied to engineering courses.**

Index Terms - Cooperative Higher Education, Engineering Education , Internship, Work Terms

INTRODUCTION

The statistical numbers have been showing a reduction of the participation of public higher education institutions in the total registers of students in the Brazil. In 1992 about 41% of the students attended to the public higher education institutions. The number decreased to 38% in 1998, 30% in 2002 and about 29% in 2003. The low participation of the public institutions allows that only 9% of the students between 18 and 24 years attend to a higher education course, a number below Argentina (32%) and Canada (62%). In 2003 the public education institutions offered 281,213 vacancies against 1.721.520 offered by the private higher education institutions as presented on Figure 1. Within that scenario, the Brazilian government has been considering the creation of about 400.000 new vacancies in next four years, with a commitment on quality and within a sustainable environment considering the technological development of the productive structure.

The education model to be adopted by the government in the proposal for the expansion of the vacancies, will have: to take into consideration the expectations of the constantly changing work market and to fit the formation of the students to the work situations, considering that the work market will not necessary offer enough internship programs or vacancies to all the students close to their education institutions. The vacancy expansion in higher education in Canada had as one of its models, the Cooperative education. Such model could perhaps be a solution for Brazil.

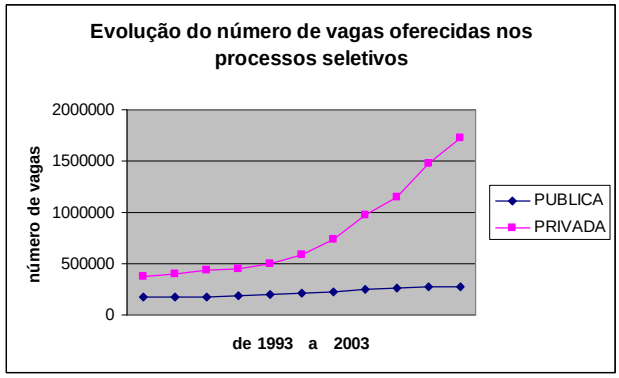

FIGURE 1
THE EVOLUTION OF THE NUMBER OF VACANCIES OFFERED IN THE ADMITTANCE EXAMS BY THE PUBLIC AND PRIVATE HIGHER EDUCATION INSTITUTIONS[1]

THE PROPOSITION

Cooperative education is an education model that promotes learning through lessons based on the work. This model allows an effective integration of the companies and the higher education institutions in the formation of professionals qualified to face the dynamism of the work market, which demands fast adequacy of functions and up-to-date knowledge concerning the technological innovations [2]. The program consists of alternating quarterly periods of

[1] Patricia Helena Lara dos Santos Matai, Escola Politécnica, University of São Paulo, São Paulo, Brazil – pmatai@usp.br
[2] Shigueharu Matai, Coordenadoria do Espaço Físico, University of São Paulo, São Paulo, Brazil – shigueharumatai@usp.br

lessons with periods of professional activities in the form of curricular periods of training (Work Terms, internships). This methodology of education foresees that at least one third of a course is to be developed in programs of professional practice. The model presented considers the reorganization of the school calendar, into quarterly periods instead of the usual semesters in order to optimize the resources of the institutions and to add complementary benefits to the formation of the students. Table 1 presents a comparison between a traditional semester education model against a quarterly Cooperative model for a five year lasting course (an engineering course for instance).

TABLE 1
MODELS OF SEMESTER AND QUARTERLY STRUCUTRES

Semester– Traditional												
year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st			**C**lass 1					**C**lass 2				
2nd			**C**lass 3					**C**lass 4				
3rd			**C**lass 5					**C**lass 6				
4th			**C**lass 7					**C**lass 8				
5th			**WorkTerm**					**C**lass 9				
Classrooms			4					**5**				
Work Term (Internship)			1					-				

Quarterly– Cooperative												
year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st	**C**lass 1				**C**lass 2				**WT** 1			
2nd	**C**lass 3				**WT** 2				**C**lass 4			
3rd	**WT** 3				**C**lass 5				**WT** 4			
4th	**C**lass 6				**WT** 5				**C**lass 7			
5th	**WT** 6				**C**lass 8				**C**lass 9			
Classrooms	**3**				**3**				**3**			
Work Term (Internship)	2				2				2			

EFFECTIVENESS

The accomplishment of 6 modules of period of training of 4 months, concomitantly to the graduation, adds a professional 2 years (24 months) experience to the graduation diploma, providing actual opportunities for good jobs and an efficient fitting to the reality of the work market. The interaction between the education institution and the work market makes possible for the students to catch statistical information on the expectations of that market. It makes possible for the education institutions to take corrective actions in the programmarian contents of the courses, and to adjust the profile of the graduated students for the constantly changing work market.

The quarterly Cooperative model represents an interesting solution for the increase of the number of adimittances in the university courses. It is an efficient means to attend to the demand for fully qualified and efficient professionals.

The activities developed in the periods of training (Work Terms, internships) with exclusive devotion make possible for the students to choose to go abroad in search for the best programs of professional qualification, meaning then a complementation on their education [3].

THE PROFESSORS'S CHARGE

For the models considered on table 1, the curricular contents of both models (semester and quarterly) are equal and consequently, they require the same number of professors. When a third period is introduced, it occupies a period pertaining to school vacations, with a new distribution in the school calendar. The number of days of activities per year results to be equal to 210, as indicated in the sequence:

- 1 school year = 3 quarterly periods
- 1 quarterly period = 4 months x 30 = 120 days or 120 / 7 = 17 weeks
- 1 quarterly period (or period) = 17 weeks
  - 14 weeks of activities;
  - 1 week for final exams;
  - 2 weeks of school recess.

1 school year = 3 quarterly periods of 14 weeks = x 14 x 5 = 210 days of activities/year.

The distribution of the didactic charge could be divided into 5 groups of professors. For the example presented on table 2:

- group 1 of professors teaches lessons for Class 1 and Class 2 and supervises the students in Work Term1.
- in a similar fashion: groups 2, 3 and 4.
- group 5 of professors teaches lesson for Class 9 and supervises periods of training (Work Term) 5 and 6.
- during the modules of WT, the professors visit the students in the periods of training, interact with the supervisors of the trainee and check the conditions of the Work Terms.
- at the end of the WT periods, the professors evaluate the performance of the students,

considering a written report presented, their evaluation accomplished by the supervisors and the evaluations accomplished by the professors in their visit to the students.

TABLE 2
THE PROFESSORS'S CHARGES DISTRIBUTION

The Professos's didatic charge distribuition			1st quarterly period				2nd quarterly period				3rd quarterly period			
Group	Classes	Internship	J	F	M	A	M	J	J	A	S	O	N	D
1	Class 1 and Class 2	WT 1	Class 1				Class 2				WT 1			
2	Class 3 and Class 4	WT 2	Class 3				WT 2				Class 4			
3	Class 5 and Class 6	WT 4	Class 6				Class 5				WT 4			
4	Class 7 and Class 8	WT 3	WT 3				Class 8				Class 7			
5	Class 9	WT 5 and WT6	WT 6				WT 5				Class 9			

ACADEMIC COMPLEMENTATION

The periods of the WT could also be carried through as an academic complementation in other areas of knowledge or in other institutions that offer periods in the quarterly structure, without compromising the student's academic devotion to the official program of the course. By being of exclusive devotion, the internships modules could be accomplished in other cities, states or in other countries. For the sutdents, that means an increase of the work possibilities and provides an experience with other realities and cultures [2].

COURSE OPTIMIZATION WITH 2 UNBALANCED GROUPS OF STUDENTS OF 1 QUARTERLY PERIOD

If there exists the demand for 2 groups of students, it becomes much more interesting to offer unbalanced groups of one period instead of two parallel groups. Therefore, the same academic module of classes is offered again in the next period. As the classes for the groups 1 and 2 (I and II) are programmed in different periods, that is, the classes of the group 1 (i) in the morning period and the laboratories and workshops in the afternoon period and the classes of the group 2 (II) in the opposite distribution, the use of the dependences of the institution are optimized. Tables 3 and 4 present, respectively, a comparasion between the schemes for a semester course and for a quarterly course.

TABLE 3
TRADITIONAL SEMESTER COURSE

Semester - Traditional Group 1												
Year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st			**C**lass 1					**C**lass 2				
2nd			**C**lass 3					**C**lass 4				
3rd			**C**lass 5					**C**lass 6				
4th			**C**lass 7					**C**lass 8				
5th			**WorkTerm**					**C**lass 9				
Classrooms			**4**					**5**				
WorkTerms			**1**					-				

Group 2 – diphased												
Year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st								**c**lass 1				
2nd			**c**lass 2					**c**lass 3				
3rd			**c**lass 4					**c**lass 5				
4th			**c**lass 6					**c**lass 7				
5th			**c**lass 8					**workterm**				
6th			**c**lass 9									
classrooms			**5**					**4**				
workterms			-					**1**				

The observation of Table 3 shows that the two groups of the semester model need 9 (4+5) classrooms in the first semester and also the same number of 9 (5+4) classrooms in the second semester, and a set of vacancies for the WT (internship) programs. The students of group 2 in the second semester will fill the set of vacancies filled by the students of group 1 in the first semester. Those students substitute the students of group 1, as they return to the education institution. Table 4 points that the two groups of the quarterly model need 6 (3+3) classrooms and 4 (2+2) sets of WT (internship programs) vacancies.

TABLE 4
QUARTERLY PERIOD COURSE

Quarterly periods - Cooperative – division I												
Year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st	**C**lass 1				**C**lass 2				**C**lass 3			
2nd	**W**term 1				**C**lass 4				**W**term 2			
3rd	**C**lass 5				**W**term 3				**C**lass 6			
4th	**W**term 4				**C**lass 7				**W**term 5			
5th	**C**lass 8				**W**term 6				**C**lass 9			
C	C1/C5/C8				C2/C4/C7				C3/C6/C9			
W	W1/W4				W3/W6				W2/W5			
Classrooms	**3**				**3**				**3**			
WorkTerms	**2**				**2**				**2**			

Group division II – dephased in one period												
Year/month	J	F	M	A	M	J	J	A	S	O	N	D
1st					**c**lass 1				**c**lass 2			
2nd	**c**lass 3				**w**term 1				**c**lass 4			
3rd	**w**term 2				**c**lass 5				**w**term 3			
4th	**c**lass 6				**w**term 4				**c**lass 7			
5th	**w**term 5				**c**lass 8				**w**term 6			
6th	**c**lass 9											
C	c3/c6/c9				c1/c5/c8				c2/c4/c7			
w	w2/w5				w1/w4				w3/w6			
Classrooms	**3**				**3**				**3**			
WorkTerms	**2**				**2**				**2**			

The comparison between the traditional semester model (table 3) and the quarterly Cooperative model (table 4) with two unbalanced groups of one period, shows that the first one needs resources for 9 classrooms, against 6 classrooms for the Cooperative quarterly system. The alternation of the academic periods and the WT (internship) periods, allows the optimization of the institutions resources such as libraries, classrooms, laboratories, microcomputers, software, and other items. Table 5 presents the use of the resources employed by the students of the semester courses and during the quarterly courses.

TABLE 5
COURSES WITH TWO GROUPS DEPHASED OF ONE PERIOD

Resources used in the courses (5 year Engineering courses)	Semester	Quarterly
Classrooms	9	6
Library, microcomputer rooms, laboratories, project rooms, workshops and other dependences.	for 9 groups	for 6 groups
Books, microcomputers, software, laboratory didactic instruments and other equipments.	for 9 groups	for groups
School recess in the year	4 months	6 weeks
School occupation during the school year	34 weeks	45 weeks
Curricular period of training	4 months	24 months
Set of WT (internship) vacancies	1	4

THE OPTIMIZATION OF THE RESOURCES

The university education requires the use of new technologies such as microcomputers, educative software, laboratory equipments, multimedia devices, and videoconference rooms. The optimization does not reduce the number of classrooms, laboratories and workshops, but it extends to the technological resources, that get obsolete. The resources use should be intensive to compensate the monetary investment. As the groups of students are unbalanced, twice as much students will use the same equipments [2].

DISTRIBUTION OF THE PROFESSORS'S DIDACTIC CHARGE

According to the contents presented on Table 6, it is possible to distribute the professors's didactic charge in the quarterly model that comprises two groups, into 3 groups of professors. A group of professors "X" teaches for instance, in the period between May and August, the set of disciplines relative to the modules of class "C2, C4 and C7" and the disciplines in the third quarter (September the December), for the modules "c2, c4 and c7" of group II. In the following quarter (January the April) the professors supervise the students of the internship modules "W1, w2, W4 and w5". The groups "Y" and "Z" are organized in an analogous way.

EVALUATION OF THE INTERNSHIP PERIODS

The evaluation of the internship periods comprises the evaluation accomplished by the supervisor at the company and by a professor and a report concerning the period of training. Forms that evaluate the abilities and attitudes of the students in the activities during the internship periods of training are guides to bring feedback to the education institution [2]. The visits accomplished by the professors in the companies contribute for the establishment of a solid integration between the university and the corporations .

CLASSIFICATION OF THE INTERNSHIP PERIODS

The basic requirement in the internship periods is that the students deeply experience the work environment. Many times, the whole participation of the students is dependent on the level of acquired knowledge. It requires greater or minor supervision and orientation. That is, in the same company the internship vacancies can related to simple tasks and others can demand more maturity and a higher level of knowledge. Although it is reasonable that students of the first years can occupy more complex vacancies, a student of the last years does not have to occupy vacancies related to simple tasks [3]. The availability of vacancies by school year demands small corrections in the internship plans and some adequacy to the level of the student. If the vacancies are divided into groups by school year, ranks are created and a criterion of planning and control must be established in order to select the students. Table 7 presents an organization of the internship periods of training of the two groups of students, gathered in 4 groups.

The internships could be accomplished in different companies, in different departments of the same company, in companies in the productive chain (supplying company, producing company and company customer), in social projects, research institutes and other universities. These vacancies are reclassified for students within different levels of knowledge and that demand different levels of supervision.

TABLE 6
PROFESSORS'S CHARGES

Distribution of the didactic charge													
		J	F	M	A	M	J	J	A	S	O	N	D
X		W1/w2/W4/w5				C2/C4/C7				c2/c4/c7			
Y		c3/c6/c9				w1/W3/w4/W6				C3/C6/C9			
Z		C1/C5/C8				c1/c5/c8				W2/w3/W5/w6			

TABLE 7
LEVELS OF THE INTERNSHIP PERIODS

Distribution by period of internship level													
		J	F	M	A	M	J	J	A	S	O	N	D
A		W1				w1				W2			
B		w2				W3				w3			
C		W4				w4				W5			
D		w5				W6				w6			

COOPERATIVE EDUCATION

According to CAFCE - Canadian Association for Cooperative Education, Cooperative Education is an education program that integrates the academic studies of a student with the experience in work market through the programs of curricular periods of training in companies. The program consists in alternating periods of experience in business-oriented appropriate fields, industries, governmental institutions, of social services and companies, in compliance with the following criteria:

- Each training program is developed and/or approved by the Cooperative educational institution in compliance with its pedagogical project.
- The student of the Cooperative course is engaged in the productive work instead of being a mere observer.
- The student of the Cooperative course receives remuneration for its played work.
- The institution of Cooperative education monitors the progress of the student in the work.
- The performance of the trainee in the work is supervised and evaluated by the company, who receives the student from the Cooperative course.
- The time of experience of work in companies will have to be of, at least, 50% of that one destined to the academic activities in the school.

Cooperative education approaches the three involved parts in the educational system: the institution of education, the companies and the students. Its success therefore depends on the commitment of each one of these parts.

The students develop their periods of training in a company or as a career program in which they develop their activities in diverse sectors of one same company exerting different functions.

The Cooperative education evolved for two predominant models. A model, in which the students alternate quarterly periods of academic modules in the schools with quarterly modules of periods of training remunerated in the companies, successively until the end of the course. With the exclusive period of period of training, this model allows an ample market of work for the trainee. The other is "a parallel" method that divides the day in two periods, the morning period that is carried through in the school, with one another afternoon period that it is carried through with work in the companies. This model depends on the locomotion time and, therefore, it is only viable for a regional market of period of training.

The methodology of Cooperative education includes the accompaniment through seminaries and visits of the professor, a person who orientates in the workstation of the student. For bigger structures, a group of Coordinators of periods of training, with formation in the same area of the courses and duly qualified, visits the students in the companies and guides in the career development. At the same time, these internship coordinators effect prospect actions for new vacancy opening. They carry through and they direct the evaluation of the students and the companies to the school. Annual events between the faculty and the supervisors of the companies are programmed to also divulge the abilities offered for the institution of education

with the exchange of information and consolidation for other partnerships. This type of Cooperative education develops the interaction university-company and promotes in the students motivation for a strong formation, clarity in the conduction of their careers, enhances the possibilities of getting good jobs, the vocational maturity and to the employers a flexibility of the work force, conscription and retention of trained workers.

CONCLUSION

Conventional education is based on a secular structure, whose philosophy is based on the fulfillment of goals. This model of education has as its basis the principle that each student, to reach a definitive goal, will have to provide itself with knowledge or ability. It is a presumed possibility so that the student can associate the effort that will be demanded to reach the goals of its couse in order to graduate. In this context, the process induces the student to wait and the instructor to provide the biggest possible relevance of what it will have to be learned. This methodology of education has as main implication the fact of being appropriate to be guided for answers; therefore the student is evaluated to verify if it reached the goal of the learning. In this educational system, the conditioning leads to a qualification to exert certain functions that in little space of time can become obsolete.

The professional qualification for a global market in constant technological innovations requires an education methodology that allows a symbiosis with the process of changes and that takes into account that nor all the students have the same interests, abilities, aptitudes and vocations. The new education models will have to adjust the individuals to the requirements of work directed towards their natural and existing abilities in their culture. The adequacy becomes a source of personal accomplishment and contribution for the building of a better society [3]. A modern educational system shoud have as its main goal, to repass to the individual the responsibility of the search of its proper education, and will be developed in such a way that the individual surpasses the certainty that education is not only what occurs in the school environment. It will also have to consider, that it is not more possible for the students to learn everything that has to be learned. Much of what it is learned during a graduation period can become obsolete. On the other hand, there is much to be discovered or invented. In this scene the student's adequate qualification starts to be a process and not a state any more.

The expansion of the number of vacancies through the Cooperative model can bring an effective means to educate a bigger number of students. As those sutdents graduate, they will be able to exert their professional tasks employing their Academic education with their professional experience acquired in the internship programs.

REFERENCES

[1]MEC, Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira, Censo da Educação Superior, MEC, 2003.

[2] MATAI, P.H.L.S.; MATAI, S., "Ensino Cooperativo: Se o mundo está rápido, então é preciso desenvolver o talento", in V Encontro Nacional de Estagio, *Anais*,Vitória, ES, 2002.

[3] MATAI, P.H.L.S.; MATAI, S., "Educação Cooperativa : Ensino com ênfase no Estágio, in I Encontro Nacional de Estágios, *Anais*, Curitiba, PR, 1997.

Indicated websites

www.cafce.ca
www.ceainc.org
www.coop.msstate.edu/ced
www.eng.uc.edu/welcome/history/
www.materiais.ufsc.br
www.poli.usp.br/coop
www.uc.edu/colleges/engineering/overview.html
www.uwaterloo.ca
www.waceinc.org