

REENGE's Allocation to Recover the Teaching Quality of Physics and Chemistry Laboratories for Engineering Courses

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Abstract- *This work describes the 1995/96 REENGE's allocation use to recover Physics and Chemistry teaching laboratories for Engineering courses of Faculdade de Engenharia de Guaratinguetá - UNESP. These laboratories had submitted to a 10 years dismantling process without maintenance allocations.*

To Physics laboratories, a staff of teachers and scholarships students were organized to make a reform by equipment buying to replace old others, and to make new classes programs. To Chemistry laboratories, a similar staff had worked to include extra-class and structural units like safety sets, a balance's room, a special furnace for gravimetric analysis and a galvanic corrosion test system. Several pHmeters and others basic units had been bought.

Although computers had been bought, they was not been introduced in normal classes, firstly because the blackboard's powder and the traditional teaching philosophy maintenance (where the students must work and build each step of the experiment), and secondly because the practical difficulties to make software buys. The computers were reserved to the teachers and scholarships support, ever since to experimental teaching uses.

The results were the partial revert of the dismantling process of these laboratories.

Introduction

Brazilian government can not hide the dramatic condition of scholar education. The official marketing associated to the official government projects (like the "provão" final national test) is seen as a pathetic trying to deceive the common citizen. At the higher education, we may see two bright facts. By one hand, private faculties are taking good quality teaching, while by other hand official faculties are falling by a dismantling process.

It doesn't fit here to discuss the causation of the public education dismantling because strong political factors are present in this matter. We can really know that this dismantling process is not reversible at the present government staff.

The principal fact associated with the Brazilian Engineering education dismantling is the basic laboratories weakening. If the world education tendency is the Physical and Chemistry teaching fortifying (through a spectacular pile of new text-books and full mounted laboratories), the Brazilian schools reduce the class-hours charge to basic disciplines and forget completely the laboratories necessity.

The Brazilian Engineering education quality is seriously threatened in the public universities.

At 1995, REENGE's project had proposed a general quality improvement of high Engineering schools. This general improvement includes the basic didactic laboratories to Physics and Chemistry teaching. In the special case of Faculdade de Engenharia de Guaratinguetá - UNESP, the real necessity of Chemistry laboratory was the basic support units buys, while the real necessity of Physics laboratories was the dismantling reversion. At both cases, there was not space to improvement objectives, but just only to correct partially the UNESP (one of the three public Universities of São Paulo State) institutional omission of laboratories implanting and maintenance.

Specific Objectives of REENGE's Allocation at Faculdade de Engenharia de Guaratinguetá

Looking at the difficult conditions of the our basic laboratories, we had take the following objectives:

1. to Chemistry laboratory acquisitions - basic supporting units like balances, distillers, deionizers and safety units like waterspouts; basic bench units like pHmeters, digital multimeters and electric heatings; extra-class units like a tubular furnace for gravimetric studies and a galvanic corrosion computerized cell;
2. to Physics laboratory - a) physical space reorganization, including the implanting of a storeroom and a room with four benches for extra-class works; b) acquisitions of basic bench units like oscilloscopes, wave generators, digital multimeters, basic bench units and tools for a maintenance room and basic consumer materials for general works; c) new laboratory text guide implanting.

The CNPq's support to the project was been made through scholarships, were student participation was guaranteed.

Work Execution

At the Chemistry laboratory works, each student received one teacher orientation. Student's work was isolated and independent of a general coordination. The buying processes was been made by a institutional bureaucratic officer, closely supported by the Chemistry teacher. At the Physics laboratory working, each teacher gave orientation to two students. The staff was composed by four teachers and eight students, plus one coordinator teacher (one of the four)

and one ninth coordinating student. Each student had taken one group of three or four experiments to reform, since equipment evaluation until new experimental guidebook printing. A collective task was the physical space reorganization, including the implanting of a storeroom and a room with four benches for extra-class works. Other collective task was the choice and the buy of the tools sets and the consumption materials. The buying processes for equipment was been made by a institutional bureaucratic officer, closely supported by the Physics coordinator teacher.

The execution period for the project given by REENGE's coordination was defined since May/95 until June/96. The allocation for Chemistry laboratory was been nearly US\$ 20,000.00, and was US\$ 40,000.00 for the Physics laboratories. All this allocation was used to laboratory applications.

Difficulties

The principal difficulties were the following:

- 1) bureaucratic structure of public institution - the official rules to public institution buying generates almost insurmountable obstacles, plus big delay times because official terms; several supplying business don't were disposed to attend all the official rules and they did make the abortion of the trade; each trade abortion had resulted in two or three months delay; other problem caused by bureaucratic structure was the impossibility to choose models or marks of the equipment or devices; it is almost impossible to buy imported equipment without brazilian representing using the bureaucratic institutional way;
- 2) teaching philosophy conflict - we have two basic proposes: 1 0) "...we must to modernize the Physics teaching, using computers softwares in place of old bench kits..." and 2 0) "...we can't cut of the left feet only because the new cars don't have clutch pedal... the basic Physics teaching can't tolerate radical and volatile new values..."; this conflict had produced confusion between teachers at the buying choices;
- 3) The REENGE's allocation to Physics laboratories was only 30% of the necessity for the full recovering; we really need plus three or four news REENGE's allocations to have good teaching Physics laboratories again;
- 4) poor produce of students at the final steps like guidebooks reform, plus teacher's poor interesting to help the student (scientific research gives "return" and teaching works not); The REENGE's allocation and scholarships finished without that the new guidebooks was been written

Results

The principal results to Chemistry laboratory were the following:

- 1) safety units using waterspouts was implanted;
- 2) basic supporting units like balances, distillers, deionizers and basic bench units like pHmeters, digital multimeters and electric heatings was implanted;
- 3) extra-class units like a tubular furnace for gravimetric studies and a galvanic corrosion computerized cell was implanted;
- 4) same works at the above item had been presented by students at congress.

The principal results to Physics laboratories are the following:

- 1) partial replacing of the bench teaching equipment (traditional philosophy teaching maintenance);
- 2) partial replacing of the supporting equipment to the maintenance bench;
- 3) a storeroom and a room with four benches for extra-class works implanting; physical space organization;
- 4) two computers introduce for teaching softwares (a space for modernizing philosophy implanting);

The principal pendencies were:

- 1) optical experiments not implanting;
- 2) teaching improvement not implanting, since the allocations had just used to recovering tasks;

Conclusions and Comments

The REENGE's allocation given us some alleviation face to the dramatic conditions of our basic teaching laboratories, but we are far away from good teaching conditions. The Engineering course quality is yet seriously threatened at our public institution (and others public Engineering schools too), principally because the world-wide tendency is giving more power to basic Physics and Chemistry disciplines.

The bureaucratic rules imposed by law to public institution gives us serious troubles to buy teaching material. This trouble is not present at private institutions. This difference can put at short period, private Engineering schools at much better quality condition than public Engineering schools.

Acknowledgement

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