Project Subject on the First Year of Engineering Course: a Leader Experiment on Mechanic Engineering

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Abstract

This article offers an approach which exposes the beginner student, in the Mechanic Engineering course of UNESP Ilha Solteira Câmpus, to engineering problems as an attempt to motivate the student for the engineering course. The result of this experience showed its validity when questions as interaction among the subjects, importance of the process of project building, motivation for work in groups and breaking the fear of specific subjects are in evidence.

Introduction

Most of the engineering curriculum is made up of disconnected subjects. The interrelationship among the subjects only becomes transparent − if it becomes − at the end of the course. In general, the student must learn mathematics and physics before he/she is able to solve engineering problems [2]. This fact added to the great amount of courses that the student has to take during the first year may frustrate his/her expectation of seeing engineering profession as a creative career. The students who chose the engineering area motivated by the physical artifacts are more likely to be frustrated than others.

This work represents the application of a new teaching strategy in a course offered on an optional basis by Mechanic Engineering curriculum of UNESP at Ilha Solteira (Brazil). In order to present solutions for the questions mentioned before, this strategy exposed the beginner student to engineering problems. The efficacy of this approach can be assessed by the students' answers to a questionnaire they were given at the end of the course, by the prototypes they built, and by comments made by collaborative professors.

This article presents the general view underlying the teaching strategy and the importance of selecting project's themes so that the goals can be reached.

Theoretical presuppositions

This proposal rests on an assumption that a curricular change in the first two years of the engineering course should enlarge the student's horizon by providing him/her the necessary experience for he/she to understand the importance of using many areas of knowledge to solve engineering problems. Therefore, the integration of contents is considered to be a student's responsibility and it must be part of the student's process of growing-up. This process should aim at formation of the "human being" professional, instead of providing only specific knowledge to the student.

The subject's goals and program

The course was made up of modules with goals and specific syllabus. Others courses of similar nature are found in literature [5], [6], [7], [8], [9], [10].

The objectives of this strategy consists of motivating the student to the engineering course by connecting different subjects, enhancing subjects that are not clearly connected with others, encouraging working groups, encouraging student's creativity and search, and encouraging a process of selecting and joining pieces o knowledge in the context of engineering problems.

Therefore, the definition of the project's theme is an important factor. Depending on the theme, many course's objectives can or cannot be reached. As far as the theme of the first project is concerned, it is important that the student feels comfortable to use his/her knowledge on the definition of the problem proposed. For the second project, different factors influence the choice of the theme. These factors should make it possible for the student to experience the following: integration of knowledge acquired from different subjects; utilization of other sources of investigation as bibliographical research and conversation with teachers of specific and basic subjects; visualization of different possibilities of solutions to the problems; and consideration of knowledge that are not clearly integrated.

In 1997 the selected projects were a catapult and a distiller.

In order to reach the goals of working groups, some rules were set up. These rules emphasize the idea that everyone in the group has to cooperate and act together for the group's sake[1]. In this context, the students who cooperated with the group by accomplishing the rules were awarded.

The subject is supported by a teacher, some monitors and some collaborative professors. The teacher coordinates the work, defines the projects' theme, manages the monitor's work, promotes meetings and conditions for the students to be successful, directs the students' work, and promote readjustments on the course. The monitors participate in discussions with the teacher to decide the project's theme, and they manage the working groups so that the rules can be followed. During the execution of the second project, monitors' role is to lead group discussion of different solutions drawn out of literature and to accompany the students during "technical visits" to the collaborative professors. The collaborative professors give suggestions and

critiques to the solutions proposed by the students to solve the course's problems.

The course proposal was sent to the Mechanic Engineering Council of Unesp at Ilha Solteira as a innovative action that was perfectly inserted in the context of PRODENGE/REENGE. After the council having confirmed the importance of the proposal, a pilot experience using the principles exposed above was implemented. This happened in 1997. Now the new subject is part of the mechanic engineering curriculum, and it is offered on an optional basis to the first-year students.

Preliminary of The Course

Module - General Goals and Programations.

Module 1 - Goals

- Motivate to the course;
- associate learned contents;
- think over the value of artefacts;
- select and propose solutions;
- work in groups;
- introduce to the project process.

Programation

- Show the rules of work together;
- accompaniment to the groups by monitors, at the stage of the problem wording and definition of area of solutions;
- approbation of the first stage of the project, by the teacher;
- oral and writing introduction of the problem, of the solution proposal and of the schedule to the basic and specific teachers, with catering of answers;
- accompaniment to the groups, by monitors, on the drawing, development of and manufacture of the prototypes;
- possible modification on the solutions due to the process of fabrication with introduction of new drawings and calculations;
- introduction in public of the found solution;
- utilisation of the work realised to discuss the means of the process of the project, the method, the technique and several employed principles;
- preparation of the material to the to congress.

Module 2 - *Goals*

- Realised work in group;
- integrate subjects;
- realised searches the several information fountains;
- communicate with teachers and professionals;
- do oral and write presentations of the problem, the solution propose and the to basic and specific teachers, with catering of answer;
- pattern or prototype and possible solution revision.

Programation

- Showing the rules used to the work in group;
- discursive classes, offering necessary to the development of the project, administered by specialists teachers;
- distribution of initial material of study;
- meetings with monitors to discuss about offered material and work planning, group accompaniment by monitors, on the phase of definition of solutions areas;
- approbation of the first stage of the project, by the teacher;
- oral and writing introduction of the problem, the propose of solution and the to basic and specific teachers, with offer of answers;
- accompaniment of the groups, by monitors, on the built of the prototype;
- possible solution modification due to the built process with introduction of new drawings and calculations;
- introduction in public of the found solution;
- preparation of material to congress .

Some problems occurred in the beginning and in the middle of the course during 1997. The first problem refers to the initial impossibility of obtaining subscriptions from freshmen. Since the first-year students' schedules were previously set up, none out of the fifteen subscriptions corresponded to a freshmen. In order to fit the class profile to the new course's goals, some freshmen were invited to participate in it. The fourth and fifth-year students enrolled in the course were invited to be monitors. Therefore the course got started with three fourth and fifth-year students, a fourth-year monitor, and four groups of four students each.

A second problem refers to students' difficulty to accomplish the projects. As a delayed consequence of the first problem, only one group completed the two projects that were foreseen. A different cause for the second problem is that the first project demanded search of solution to many questions concerning the process of constructing the experimental apparatus. The readjustments that occurred during the course were in fact expected since it was the first time that the course was carried out. In fact, the readjustments provided helpful feedback for the next-year course.

Despite the problems mentioned above, the course was a successful experience. This success can be verified by the students' answers to a questionnaire they were given at end of the course. Most of the first-year students wrote that this experience showed them connections among subjects, revealed the importance of the process of constructing an experimental apparatus during the execution of a project, lessened their fear of not being able to face specific subjects in the future, and encouraged group work by making it possible for them to deal with people who held different ideas in mind. On the other hand, the collaborative professors got surprised with the creativity of the students' solutions to the problems. The professors felt that they had underestimated the students. In general, the professors considered that the students responded to their expectations in a satisfactory way since the students answered consistently the questions they were given.

The analyzes of the 1997 course gave us a lot of information to introduce some changes in the 1998 course. As we also intend to implement ideas came from cases in which the students were presented with engineering problems that we have studied in the literature, we believe that the 1998 course will be considerably improved.

Conclusion

The resolution of engineering problems can be considered an excellent teaching strategy to deal with the following necessities: motivating the student to the engineering course by connecting different subjects, and enhancing subjects that are not clearly connected with others; encouraging group work; encouraging student's creativity and search; and encouraging a process of selecting and joining pieces o knowledge in the context of engineering problems. However, this teaching strategy needs to be connected with the curricular proposal so that the subject's objectives can receive new inputs at higher levels during the course.

It is possible to enlarge the students' horizon by making it possible for them to reflect on engineering profession and its contribution to the society. To do so, the projects' themes need to be selected carefully, and the monitors need to manager the groups appropriately aiming at students' commitment to the project. Furthermore, it is necessary that the faculties believe and contribute to the success of the proposal.

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