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How to Motivate the Pupils in the Study of the Basic Matters for Engineering

Patricio A. Cullen[1], Liliana M. Marinelli[2], Daniela Salas[3]
[1,2.3]Universidad Tecnológica Nacional, Facultad Regional Delta Campana (Argentina)
[1]cullenp@frd.utn.edu.ar, [2]pilarmarinelli@gmail.com, [3]danielasalas@live.com.ar

Abstract
The science education poses the challenge of achieving a minimum motivation in students. There is a threshold in the two basic elements comprising the motivation: interested in learning and commitment to invest time and effort demanded by the demands of higher education. The student who does not reach that threshold, is destined to join the long list of deserters. In studies of engineering the most significant defection occurs in the first leg of the race, i.e. When will study the basic subjects common to all disciplines, mathematics and physics.
The objective of this work is to present instructional strategies have proven to be effective to increase the motivation of students, is to awaken interest in learning physics and math and induce them available to study these difficult matters that normally do not perceive sufficiently nor its beauty and usefulness. Show the harmonic consistency of mathematical algorithms and the subtlety of the physical reasoning, i.e. the aesthetic of both Sciences dimension, as well as applications in the resolution of problems that arise in everyday phenomena, is the key to achieve the objective of reducing the dropout. The student must perform cognitive operations such as relate to their previous knowledge and experiences with the new knowledge. This activity of the student is important, but teaching strategies are required to enable it to attain an adequate appropriation at the level of abstraction for application in diverse contexts. It is desirable that the student contribution in the process of learning their own perception and put on the Workbench sensitivity and imagination to reflect on the built-in and formulate questions that new knowledge should bring out. To develop creative minds it is more important to know to formulate problems that resolve them, especially in the first section of graduate studies. These considerations should be cause for introspection of the teacher to review its own management as essential tool in the teaching-learning process.
This paper presents teaching strategies, classroom experiences and coordinating the work of auxiliary-born and tutors peers in courses for admission to the careers of engineering course at the Facultad Regional Delta of the University technological national. These strategies for problems of physics and mathematics are:-proposal of qualitative issues and determination of the sensitivity of the results to changes in the numerical values. Qualitative analysis of consistency of partial results-registration of the production of the student at the end of each class.

Introduction
The growth of a country is closely linked with educational and experience of their youth that fosters scientific and technological vocations, since these areas of knowledge strongly affect the competitiveness of Nations which is going to enable this growth. Likewise, education policies responsible for developing long-term programmes should aim to achieve the greater number of students graduated from the medium not only level access to the University that they graduate within a reasonable time. While data show that 99% of the population is ¨alphabetized¨ in Argentina, a major defection at the middle level is seen and also aspiring students to study engineering, a high percentage racing, not have appropriated content Basic, stipulated in the Middle formation, in physics, chemistry and mathematics which means that they do not exceed the exams for admission or thicken early dropping out in the first or second level. According to the latest results of PISA, Argentina is a great problem in the learning and teaching of mathematics and science. The 66.5% of the school population of 15 years does not know mathematics and this fact, is moved in mass student aspiring to become engineers. It is not one minor issue; analyze academic achievement and socioeconomic status of the students admitted to the introductory course for racing engineering. Studies in the Delta Regional faculty allow you to correlate information that facilitates the reading of these two variables. The reports have shown that although the privately-run high schools students represent a much lower number, the results of the evaluations reveal better performance from fraction of schools of public

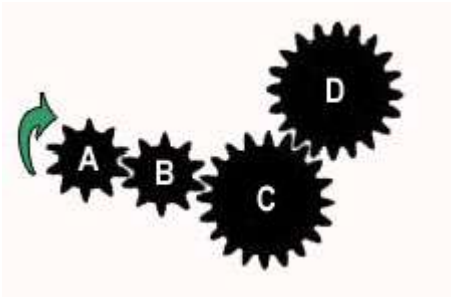
administration, which is an indicator of lack of equity, evidenced by the segmentation according to economic level, the students from schools of public administration.
The main difficulty, not only lies in the deficit observed in contents of the basic materials for engineering, but also in the lack of representation about what it means to be a graduate in a public University, the free Argentina, professional and the effort and dedication involved exploit that privilege that finances the society as a whole. Promote scientific vocations is a long-term investment. A clear and orderly planning profile of nation which is intended to is required and holds in time the necessary patience that will reap the benefits in the future. Scientific development is very important not only in economic growth that brings, but also (as he has been expressed in various articles) because it can be seen that most democratic countries, with better welfare for the society as a whole and greater social development are those where advance science has been a priority in State policy. Motivation in scientific and technological careers should think even from job opportunities offered to receive professionals. After difficulties in reading comprehension and basic operations of mathematics, physics and chemistry students have as a sequel to a poor middle school, the next obstacle is the extension of races with these characteristics and precarious employment in a little industrialized society. Designed runs for a duration of five years, on average end up completing in 8 or 9 years as a consequence that the student population should join quickly as support labor market for your family or for own support. Hopefully, many of the students who start working in the first years of its higher education manage to complete their studies, but a high percentage is on the road and abandoned in the early years of the race. Reversing this situation is the desired objective.
The desire to learn is one of the basic characteristics of the human condition. The role of the teacher of physics and mathematics is to induce in the student the desire to include their arduous content in their natural eagerness to learn.
That's what we define as motivation, and increase it to three strategies are presented in this paper to achieve this, the three framed in two essential requirements:

- **Reveal the harmonica of the mathematical algorithms consistency**
- **Reveal the subtlety of physics reasoning.**

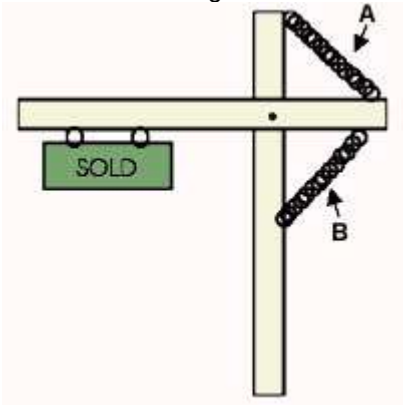
The above strategies are:
First didactic strategy: proposal of qualitative issues and analysis of the sensitivity of the expected results to changes in the numerical values of the dates.
Second didactic strategy: Qualitative analysis of reasonability of partial numerical results obtained in the process of strategy teaching Resolutions.
Third didactic strategy: registration of the production of the student at the end of each class.

Required prior clarification:
Here means algorithm to the orderly sequence of steps to solve a problem. In that sense, it can apply to a recipe or a gymnastics routine. And of course to mathematics, for example calculate the unknown in an equation or the unknowns of a system of equations or power of a number 7. In all this are the algorithms that solve them is the sequence of steps in implicit or explicit to be followed, and in addition there is an essential difference with others who may be independent mathematical algorithms between si - as the recipes or gymnastics - mathematical routines must be consistent.
Issues of way of disclosing it or induce that the student can by itself discover it must be submitted as to the subtlety of the physical reasoning.
Presents two illustrative examples for the capacity of understanding of displacement and mechanical behavior of an object subjected to basic physical principles and to capture forms and parts of a system and how they interact, including having a vision of the whole.

In which direction will rotate the pinion "D"?:



Which of the strings will hold the notice?



Background

Regional Delta of the University technological national, aware of its relevant role in the education of engineers in Argentina, fostered the emergence and consolidation of a specific research group, the Group of access and permanence (GAP) to study and to reformulate the leveling system for access to the careers of engineering, which began by the coordination of the preparation of teaching new material taking into account carried out field work to record and systematize surveys teachers, assistants and support fellows and laboratories, linked to the transit of the pupils in the first two levels, or consider and evaluate especially the opinions expressed by all stakeholders involved in the described problem. The existing system is the University seminar of leveling, annual duration, that is, as he has been explained, the culmination of a long journey of exploration to answer the need for a proper process of preparation for the studies of engineering based on the following goals for each student:

Effective inclusion in the University environment is the applicant become a college student, and it according to the current realities and our experiences with various forms of dictation, has achieve a greater number of students with a contemporary, annual seminar or not to the last year of secondary. Annual preparatory traffic that a further breakdown during graduate studies is best for the student.

Take the lead in their own education,

The idea to extend a minimum of one year preparatory course is to make possible, and more likely to achieve unstructured and creative students with ability to sustain their intellectual growth and cultural.

To get autonomy, individual effort, as essential.

The culture of effort sustained student brings incorporated or less associated with teaching (talk about the candidate means coming to our door). Tend to think that knowledge you will be given and has to attend class, take note of what the teacher and study that the assessments. That learning scheme does not have any point of contact with the College of engineering. The processes of appropriation of hard content, the level of abstraction required different specific cases, require time for reflection, manipulation and interpretation of data, intricate processes of numerical calculations, of correct assignment of different systems of units, from reading and Assembly of graphics, qualitative analysis of expected results, validation of results with criteria of general and discipline-specific logic and all required hours of study , reflection on cognitive advances, identification of their difficulties and obstacles for these developments and, above all, spirit of struggle to overcome those setbacks and difficulties and advances.

As first stage developed a diagnosis of faults of the average applicant student:

- Comprehension difficulties to understand statements of problems.
- Ability to transfer knowledge to situations new.
- Effective habits of study
- Cognitive aspects of secondary
- Management numerical and symbolic
- Logic validation and contextual results.
- Self-control in instances of necessary evaluation.
- Work after class
- Immaturity for autonomous study

With these inputs and the conviction that the requirement improves performance, prepared a material where we sought to improve the initial "status", so transform the applicant in a university student. Example: we can highlight that there are modules of mathematics and physics where challenges the student to build the necessary graphics for the study of specific topics. I.e. it is said: "as shown in graphic b" but that the graph is not and are given elements to the student so that he can do it. To achieve this you have to understand the explanatory text and transfer it to a graphic. And that has potential inducer of analytic and reflective thinking.

Teaching Strategies:

In the summary of this presentation we have subsumed into three didactic strategies implemented:

- Proposal of qualitative issues and determination of the sensitivity of the results to changes in the numerical values.
- Qualitative analysis of consistency of partial results.
- Registration of the production of the student at the end of each class.

References

[1] Emails are provided by the authors of this work, in order that interested parties can obtain referrals study materials used to work the didactic aspects to increase motivation that have been described.
[2] Statistical tables are also available concerning the types of school and student characteristics provenance (geographic dispersion, family and employment status, academic performance in the first leg of the studies).