

## PROBLEM BASED-LEARNING IN SOPHOMORE AND FRESHMEN ENGINEERING STUDENTS: A FOUR YEAR FOLLOW-UP

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The ITESM's teaching model has evolved in the last years. Within this evolution process, several problems were identified in the former model used in ITESM to teach mathematics and engineering. These problems involved both teachers and students. For instance, there were poor knowledge retention in students, courses were too centered in algebra instead of developing mathematical reasoning and rules and algorithms were preferred rather than practical applications in the areas students are usually interested.

*Principia* is an engineering academic program which comes out from the idea of overcoming those difficulties. The main purpose of *Principia* is to develop a mathematical, physical and technological culture in students that will make them able to analyze and solve complex problems. This is achieved with the integration of different subjects in one unique program where the classroom and learning environment are considered. Therefore, the learning specter of students over different knowledge areas is enlarged.

*Principia* has been planned and implemented for the four first semesters of engineering school. It is based on the theories of several researchers, therefore several channels are used in the learning process and the emotional aspects of learning are also considered. Some of the basic tools used by this program are problem based learning (PBL) and heavy use of computer technology. The are five fundamental principles in *Principia*:

- a) The integration of the curriculum for mathematics, physics, and computer sciences.
- b) Collaborative learning.
- c) Teamwork.
- d) An emphasis in mathematical modeling as a fundamental tool for Sciences and Engineering.
- e) The use of technology in the learning process.

With all these elements, *Principia* has evolved as an integrated program that considers objectives, knowledge, methodology and an evaluation system which develops in the students the AAV's of the new teaching-learning model of ITESM.