

ENTRY LEVEL PROBLEMS DIAGNOSIS, PARTIAL SOLUTIONS, THEIR EVALUATION AND NEW PROPOSALS

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Abstract — Severe entry level problems are observed in the case of a Mexican school of engineering. Besides problems related to knowledge and skills in basic sciences, students lack study habits; the transit from annual to three month terms demands them to work under pressure and finally, social, economical and psychological aspects are involved. Not all the teachers, despite their scientific level, are concerned with these problems. Several actions have been taken: a program of professor-advisor, updating the curricula, welcome programs, leveling courses, improving the infrastructure and promotion of the SAI (Individual Learning System). Conception, strategies and results of these measures are described. Other actions are to be applied in the near future: promotion of the bachelor programs; study habits workshops; psychological support; increasing non-curricular activities; motivational events; a program of courses for the development of teaching skills and including professional subjects from the beginning of the career.

Index terms — Advisors, entry leveling, individual learning, welcome programs.

INTRODUCTION

The Division of Basic Sciences and Engineering (CBI) of the Universidad Autónoma Metropolitana – Azcapotzalco (UAM-A) is located in the northern part of Mexico City. As a school of engineering, the CBI Division offers nine engineering bachelor programs, four master and two Ph. D. programs. A tenth bachelor program (Computing Engineering) is about to be opened by Spring 2003. Studies about graduates performance were done and their results are more than satisfactory; a high percentage of graduates are working in their professional field and the institution is increasingly recognized for its results, despite its youth (28 years in November 2002). As a contrast, entry leveling is one of the most concerning problems and its consequences are determinant for students advance. Desertion at the first levels is high and many of the students who stay have significant problems. An effort is being done to revert the situation. First of all, a diagnose was obtained and causes of the situation were identified. As a multivariate problem, it must be attacked from various fronts; strategies must be

coordinated and a constant evaluation is needed. Some actions were already taken and others are under planning.

THE DIAGNOSE

The Universidad Autónoma Metropolitana is one of few high education schools in Mexico with three month terms. There are three trimesters per year (Spring, Fall and Winter). A trimester includes eleven class weeks and one more for final exams. Curricula are organized according to this; theoretical subjects normally comprise 49.5 hours and laboratory courses are programmed in eleven sessions of three hours. Bachelor programs consist of 12 trimesters (4 years) and about 70 subjects. There are two admission periods per year: Spring and Fall. Although between 700 and 900 candidates are admitted in a period, not all of them finally register; normally 8 or 9 out of 10 do. In extreme cases, such as Spring 2002, only 7 out of 10 new admitted students effectively registered. The first trimester is critical, because desertion is significant along this term. In some cases, only one half of the initially registered students remain active until the second trimester. In addition, other figures are significant to show the failure of the new admitted students, such as the accreditation rate in some subjects; Calculus I, for instance, has had an average of 35% per period between 1993 and 2001. It is difficult to determine the causes of this situation but some of them may be assumed as a result of studies and inquiries applied to students and teachers.

- Most of the new admitted students are used to semester or yearly terms. The adaptation to trimester terms force them to study under pressure. The advantages of this are evident, because the future professional develops skills and attitudes to work under pressure and adverse conditions. However, adaptation to this should be gradual.
- The students academic entry level is low, specially in mathematics.
- Students lack study habits.
- Students don't feel identified with the institution and their careers at the beginning. The institution organized few and infrequent motivational activities. Students are not organized in an association, although they share cultural and social activities from time to time. Until

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recently, there were no professional contents in the first trimesters; only basic sciences and some social subjects.

- Teachers, despite their scientific level, are not always concerned with the student problems and some of them lack pedagogical skills or training.
- The curricula spent many years without revision and updating.
- Poor promotion of the programs outside the University.
- Social, economical and psychological factors.

Considering this situation, some measures were proposed. Some of them were put in action and others are under planning. They are described and partial results are commented.

Advisors Program

There are three levels of autonomy in the University, with distinctive functions; increasingly: Division, Campus (Academic Unit) and the University itself. The CBI Division started a program of advisors in the trimester Spring 2000, on the basis of assigning a teacher-advisor to every new admitted student. This was difficult at the beginning, specially because advisors practice has little tradition in Mexico. Discussion aroused about whether it was convenient to select advisors whose professional profile was close to the student career or not necessarily; it must be pointed that successful experiences were achieved in both cases, in the U.S. and England, for instance. At the beginning, it was decided to assign advisors regardless of the career but it was noticed that the students wouldn't approach their advisors; so the policy was changed. By Spring 2002, the advisors program was assumed by the Academic Unit, as a consequence of a scholarships programs. It was conceived as an educative service created to follow up the students formation process, as individuals and as a collective, and an opportunity for planning and designing strategies to develop students skills and attitudes. Particular objectives are: to facilitate the students integration to the University; to advise the students for decision taking regarding their studies; to promote criteria and attitudes to contribute to the students' autonomy; to help the students to the early identification of common problems in the studies and to assist them to find solutions; to encourage the rational use of the resources offered by the institution and to contribute to the self evaluation process undertaken by the University. Partial results of this program are not really encouraging; students do not meet their advisors as often as they should, even at the advisor's call. The conclusion is that it's a cultural matter, which only practice and insistence will revert.

Updating the curricula

This is a difficult task in this University for various reasons. The democratic organization of the institution demands that many sectors are to be consulted to take such

decisions and the three government bodies (corresponding to the Division, the Academic Unit and the University) have to approve the proposals. Another feature is that the different careers share subjects, not only in the basic level but also in advanced trimesters; this happens for instance with environmental dimension or systems engineering subjects and more emphatically in careers with common interests; thus, the updating of one career necessarily affects others. Finally, regulations demand that only one program must be in force at a time for the same career; so, when a program is updated, the academic record of every student must be converted into the new one. By 2000, the curricula of all nine bachelor programs accumulated a considerable delay in their updating, despite remarkable initiatives; only local and limited revision was registered. A great effort was done in 2001 and 2002; the programs of the nine careers were revised and even a new career was created. Once the programs were updated, all of them applied for accreditation to the CACEI (accreditation board for Mexican engineering programs), a practice of increasing importance and recognition in Mexico. Obviously this kind of actions is very important but, how does it help the first level students? Some elements considered in the changes were directed to this. In some careers the number of credits in the first trimester was lowered, in order to make easier the transition to the university life. The curricula structure was changed into a more flexible one; the prerequisites to take some subjects were suppressed; when the previous programs were in force, students who didn't approve math subjects of the first trimester, weren't allowed to take physics subjects of the second one, with severe consequences for the advance in their studies; this condition was canceled. Some careers introduced professional subjects in early stages. Finally, modern techniques were introduced for evaluation and teaching itself. Updated programs were put in operation in October 2002; a permanent follow up is planned to evaluate the results.

Welcome programs

The Academic Unit has always offered welcome programs to new admitted students, to get them introduced to the university life. The Divisions and Programs Coordinators have also contributed to this activity, although less regularly. An effort was done since 1999, to coordinate the participation of the different institutional branches and even students groups in a program called PIVU (Integration to University Life Program). It is essentially a one day event directed to promote an integral relation between the new admitted students and the University. It is conducted during the first week of the trimesters corresponding to admission periods (Spring and Fall). Its particular objectives are: to offer the new admitted students a global vision of the services offered by the University; to give information about the academic, cultural and sport activities, about the student's rights and duties and where they can get specific

information and support; to promote a sense of belonging and identification with the institution. Activities are: information stands about the careers, information stands about institutional services (foreign languages, cultural activities, sports, computer services, library, school administration, educative orientation, graduates, medical services, etc.); an artistic event, such as a concert, is generally included. Again, the students participation in these activities is never as wide as desired; however an opinion poll applied to them showed the following results: They consider that the PIVU is an important event to know the services offered by the institution; they feel important for the University; they believe that more publicity is necessary and that advanced students should cooperate more.

Leveling courses

Most new admitted students have an insufficient background, particularly in mathematics and physics. This has lead to think that leveling courses could be a chance to level them to the basic sciences courses of the first trimester. Opinions vary from dedicating a whole trimester to these courses and make them compulsory for students who are unable to pass a special exam, to those who propose to set them as optional courses for the students, limited to a period of one or two weeks, prior to the formal teaching. A document produced in 2000, for instance, suggests that students with deficiencies in basic sciences should take a set of courses during one trimester, including mathematics, physics and study habits; the student is supposed to dedicate full time to this activity. However, this was never put into practice. Instead, a set of mathematics, physics and induction to the University sessions was offered since Winter 2002; although this is not an admission trimester, the course was initially offered for students who had been admitted in Fall 2001 and, for some reason, decided to inscribe later. This first time only 8 of them attended the sessions but in Spring and the Fall that figure grew to more than 70, about 10 to 15% of the total number of admitted students. The effort was successful, particularly regarding the permanence of the participants in the school. Considering this experience, it is planned to offer a module of support courses for new admitted students, during the first trimester, simultaneously with regular subjects. This will start in Spring 2003.

Improving the infrastructure and promotion of the SAI (Individual Learning System)

This is an alternative to the traditional teaching-learning method. Its most important features are the following: excellence learning, as a possibility for every student; active participation, this requires than the student plays an active roll in the learning process; and positive reinforcement, suppressing every element related to penalties. As an individual learning system, the SAI teacher acts as a guidance and a learning facilitator for the student but must

provide him (her) with material enough for the lessons. The SAI allows the student to advance at his (her) own rate; he (she) may even spend two trimesters for a certain subject if necessary; exams are more frequent and with less contents than those ones of conventional courses. That's why this system is suitable for slow progress students as well as for high efficiency ones. Not all subjects are offered through this systems but most of the basic level ones are. Other limitation is the resources dedicated to this program but considering its importance and potential to help students, they were increased in recent years. Promotion of the SAI is sometimes difficult because students are not used to play an active roll in the learning process but students themselves are the best promoters, because those ones who have the experience are generally satisfied and come again. Another important fact is that an extra effort was made to help, through the SAI, students who have failed in their first mathematics courses.

Promotion of the bachelor programs

The University is located in one of the largest urban concentrations in the world, with more than 20 million inhabitants. Despite this impressive market, there are more than 20 schools of engineering in the area, either public or private ones. Some of these institutions include high schools, which are natural providers of candidates to professional programs; the UAM doesn't, as it is established in its Organic Act. Publicity is difficult because it's very expensive to reach to so many people and the budget for this purpose is limited. Thus, the most suitable way to promote the bachelor programs and to get more and better candidates is going to selected high schools; presentations, conferences, brochures, panels and stands are adequate means for this objective. Some Program Coordinators have had initiative enough to follow such kind of activities by themselves. The Metallurgical Engineering Coordinator (co-author of this paper), for instance, has participated in radio programs, visited high schools and secondary schools, conducted guided visits in the University, wrote a manual with a study about the Division promotion and participates in a periodic event called October. Science Month, organized by the CONACYT (National Council of Science and Technology). Other experiences show that the presence of advanced students in visits to high schools is strongly motivating for potential candidates. It's expected that the programs accreditation will increase the prestige of the Division and will become a fine credential for its promotion.

Psychological support

Important help to students is given by the Office of Educative Orientation and Psycho-pedagogic Support, which depends on the Academic Unit. The psychologists team of this office give professional care to students who suffer from addictions, personal or familiar problems and, if necessary, patients are sent to specialized centers, linked to the

University by formal agreements. Another activity of this office consists of giving professional orientation to students, specially through workshops; it must be pointed that many students select their career without a proper orientation and with this kind of help, they have a new chance for their turning point. Several events are organized by this office, such as lectures, workshops and video showings, related to subjects such as VIH-AIDS, addictions and emotional cycles.

Motivational events

It's important for students to feel that their effort is recognized by others, including the institution itself. A program of awards for excellent and very good performance students was established in 2000 in the Division CBI. Standards to define both categories include marks average and number of credits approved in the previous trimester. Awards are granted in a ceremony with the assistance of the President of the University. Other actions in this front are lectures and seminars, conducted by successful graduates; they are organized by the Program Coordinators; the example of the Mechanical Engineering Coordinator is remarkable.

Program of courses for the development of teaching skills

One of the most important elements of the teaching-learning process is the teachers. Although their academic level is high compared to the average schools of engineering in Mexico, not always their pedagogic skills are similarly good. A program of courses for the development of teaching skills was launched in 1999 to contend with this situation. Courses are offered in the periods between trimesters. Fourteen different titles were given, some of them as many as four times. Engineering teachers demand with preference the following courses: Learning Evaluation (the most demanded one), Didactics and Teaching Techniques, Learning to Learn, Educative Multimedia and Group Techniques Applied to Teaching. As a result of this program, teachers get increasingly involved and encouraged to take this kind of training.

Other actions

The Mathematics Club is a space, operating since 2001, where advanced students help their fellows of the first trimesters with their studies. An idea under planning is the organization of a study habits workshop, in order to help students to organize their time and to develop correct study habits and techniques. Information systematization is another task undertaken by the University, to provide teachers, authorities and even students, with enough information in real time to make diagnoses, analysis and to evaluate results. The development and implementation of modern teaching techniques are also important; the

University purchased specialized software to promote web based teaching, which is already used by many teachers and a related project was approved in the Division.

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