Experiences with a new scheme of assessment in a college institution in San Luis Potosí, México. Case study

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Abstract

Currently in Mexico, Government has been promoting a novel education model, EBC (Educación Basada en Competencias), focused not only on knowledge but on developing skills and attitudes, to fit students into society and workplace. Model implies teachers to have a broader view of their role in training and assessment of students, and appreciate not just academic advances but also important aspects of training and attitudinal to develop skills needed to have along their career. In this model, it is required that students change their attitude from passive learners to active learners. This paper presents results obtained from evaluations based on an EBC model. This model allows us to visualize the performance of students throughout their training in a physics engineer course in different areas, each one with its own learning environment and its own advisor. Student´s performance is viewed in this paper using a traditional method versus a novel one. The second one, as a result of implementing new instructional strategies by teachers, employs less evaluation time and better consequences than the first one. On the other hand, approving rate has been improved with the aim of a traditional course. For evaluation, we used items that students knew, so they knew the performance levels needed.

Keywords: Skills, Evaluation, Education.

Resumen

Actualmente en México, se ha venido impulsando un modelo de educación, centrado en desarrollar en los estudiantes, no sólo conocimientos, sino habilidades y actitudes a fin de que les permitan insertarse en la sociedad y en el campo laboral. Este modelo implica que los profesores tengan una visión más amplia de su papel dentro de la formación y evaluación de los estudiantes, y valoren aspectos importantes en la formación, no sólo académica, sino actitudinal, a fin de que desarrollen habilidades necesarias que deberán de poseer en su perfil profesional. Con lo que respecta a los estudiantes, el modelo exige que los estudiantes cambien su actitud de alumnos pasivos a alumnos activos. En este trabajo se presentan resultados obtenidos al evaluar a los alumnos en base a un modelo, que permite visualizar el desempeño de los estudiantes en diferentes aspectos durante su formación, en un curso de Física para ingenieros. Los resultados se obtuvieron en ambientes de aprendizaje diferentes, cada uno con su propio evaluador. Los resultados muestran que este modelo permite obtener resultados del desempeño de los estudiantes a un tiempo más corto que si se utilizara un método tradicional de evaluación. Además de que permite al maestro mejorar o implementar las estrategias didácticas, a fin de obtener mejor rendimiento de sus alumnos. Por otro lado, el índice de aprobación mejoró en relación con un curso llevado por el método tradicional. Para la evaluación, se utilizaron rúbricas que conocían los alumnos, a fin de que ellos conocieran los niveles de desempeño que eran necesarios alcanzar.

Palabras clave: Competencias, Evaluación, Educación.

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I. INTRODUCTION

The new technologies of communication and computing, Globalization and the fast technological progress, play a principal role in the new knowledge society. Now a graduate of colleges not only compete for a position in companies with their classmates or others from local institutions, but graduates of other institutions abroad the world. Finally, those who possess the best knowledge, skills and job's abilities, manage to enter the workplace.

This has led to propose a new approach to the paradigm in undergraduate education, which differs from traditional methods because it now requires a continuous training and evaluation that goes beyond the university environment, and includes employers who will now evaluators [1].

Following this trend, Mexican educational system has promoted a set of reforms from the basic levels to undergraduate education, with the purpose of integrate knowledge, skills and attitudes at students that are desirable for the society to which incorporated. Specially, the Universidades Politécnicas Subsystem (UUPP) has considered this training type to be part of the model UUPP under a scheme called *Educación Basada en Competencias* (EBC), so serves student for face to the challenges presented to it on a personal and professional work level [2, 3].

II. BACKGROUND

The Universidad Politécnica de San Luis Potosí (UPSLP) has been worked since its creation (June 27, 2001) by the State Executive, with a educational flexible model, student-centered and regional labor relevant courses [4]. Since UPSLP birth, the Federal Government encouraged efforts for establishment of Universidades Politécnicas along the states, which ultimately led to the creation of the Coordinación de Universidades Politécnicas (CUP), which currently brings together 43 institutions throughout the country, whose mission and vision is the integral persons formation under quality standards and the relevance of their educational programs, to be expressed in the technical competence and personal qualities of its graduates [5].

Within CUP, the term Competence is defined as the set of capabilities that include knowledge, skills and attitudes achieved through learning processes and manifest themselves in solving problems, namely, in action. Under this definition, a student success in mobilizing resources to solve specific situations in different contexts is competent [5, 6].

Moreover, despite the efforts made in previous educational levels to the University, persist the problem of high rates of failure and underachievement in the areas of physics and mathematics in the first semester college students, given that aren´t able to relate directly the content of these disciplines in their professional training, so these areas are identified as a selective filter student to remain at the universities, as well as the main causes of school failure, defined as the negative gap between the capacity the student and the real standard required by subjects [7].

With this background, the Academy of Sciences of UPSLP (AC-UPSLP), implemented the competence-based system (EBC), which incorporates many aspects of the constructivist paradigm [8, 9, 10]; among others demands, students must change their attitude from passive to active learners, and the teacher is not only a knowledge transmitter but a facilitator of it, who guides students in their pathway to develop skills that impact on their graduate profile. To carry out the implementation of the EBC model, the UPSLP has promoted the training of teachers to respond to requirements this model demands.

III. METHODOLOGY

Since the focus of the EBC, the graduate profile of the student sets the standards for defining professional and labor skills to enable it function in their field, so matters of courses are considered not in isolation, but closely together with the graduate profile as each one contributes with elements (skills, knowledge, attitudes, etc.) to help students develop the skills needed in it.

Taking reference The Tuning project [11], which mentions the skills and abilities that graduates should possess at undergraduate level, Physics subjects contribute to the graduate profile with the construction of the conceptual framework, a model of the world, the ability to solve unstructured problems and the understanding of their work environment, besides to be able to describe and explain natural phenomena and technological processes as concepts, theories and principles at physics terms, among others. Thus, the EBC approach is based on systematically assess and consistent performance that leads the student through a series of activities that allow them to show the degree of competence development, under conditions closer to real problems [12, 13, 14].

Along first year of college in UPSLP students have two courses in physics: Introductory Physics at first semester, and Physics I in the second one, both with class sessions of one hour per day (Monday- Friday) and two lab's hours per week. Introductory Physics aims to lead the students to acquire the minimum income profile so it is considered extracurricular, while Physics I course is part of the curriculum.

To carry out the EBC assessment, the AC-UPSLP proposed three key elements. First establish the optimal performance level that would get a competent student, and from this has been developed lower levels (or degrees of competence development) students could achieve. A total of 5 development levels were set consistent with UUPP model. The levels are (from lowest to highest degree): Not competent (NC), Basic (B), Advanced Basic (BA), Independent (I), and Competent (C) (see Table I). Ideally all students must achieve C level, but most of them are admitted on NC and B levels (based on data from the first partial assessment of the matter of Introductory Physics), so teacher's task is a series of activities with students to reach higher levels. On this scale NC and B aren´t approbatory, and correspond to student who have not made enough efforts, or a person who have an inadequate training. On the other hand, instruments were designed to assess and evaluate student performance in various activities that the teacher suggests to students group. These instruments and the description of levels are written in the form of rubrics and checklists, and delivered to students who know, indeed, the evaluation criteria and what is expected of them.

TABLE I. Description of levels of competence.

Levels of Competence				
Competent (10.0)	Independent (8.5)	Advanced Basic (7.0)	Basic (4.0)	Not Competent (0.0)
It has all the competences required by the activity completely developed. The success in the subsequent activities is guaranteed.	It has all the competences required but not completely developed. The success in the subsequent activities is very likely.	It has the minimum required competences to approve the subsequent activities.	It has no minimum competences to approve the subsequent activities.	It has no competences for the activity or it is not done.

Another innovation implemented by the AC-UPSLP is the valuation type, which consist in three evaluators at different learning environments: the first evaluator is the teacher class, which assesses student performance on an ongoing basis and look at the competence development degree of student through a variety of activities that are proposed; the second rater is the teacher who taught laboratory, who assesses the level of student performance for solving experimental problems, either individually or in teams; and the third evaluator is another teacher who assesses student performance to solve a theoretical problem individually (written test). The written test shall occur at same time and by all the university students that attend the same subject even if the teacher class isn´t the same. This allows a continuous comprehensive evaluation which prepares students to face future evaluators and challenges, not only teachers unless employers, besides allows the teacher to improve their practice from the comments made by others teachers, students and his personal observations.

IV. RESULTS

Current teachers were educated in a completely traditional way, which gives preference to individual ability for memorizes information, giving the student a grade in some continuous scale, if asked questions have been answered correctly according to teacher. This evaluation type is uniform, no matter the student ability to learn or develop new skills; all of them are measured on the same scale alike.

The EBC offers great advantages over traditional method, because it is an ongoing process which has no fixed timing, transcends the classroom and in our case, is inserted into the labor market. On the other hand, implies that teachers are involved in the design and development of new instruments and didactic materials that are appropriate to competence development and make meaningful learning in their students beyond the classroom and may be evaluated by other agencies, that involves criteria building which are taken into account in the assessment in order to reduce ambiguity, being careful in not to rely simply on a continuous rating scale as referenced. This implies teachers must change their evaluate schemes based on performance, change that is not simple because it should break with entrenched patterns of traditional evaluation. To support this transition was necessary having a training teacher program to know EBC methodology, for implement this model in partial and gradual form starting from autumn 2010 semester at Physics Introductory course and using mechanisms to help teachers to visualize the EBC assessment purposes.

For the spring 2011 semester, the EBC system was completely implemented for Physics I, with participation of teachers who had previously worked with Physics Introductory. On this paper presents results obtained in Physics I class. The EBC methodology results are compared with the same subject in a previous semester (Spring 2010) led by traditional system. In both cases, Physics Introductory was an obligatory previous course for all the students, but spring students 2011 had knowledge of levels definition and what is expected of them from the introductory course.

Thanks to the above study populations are similar in size and conditions. We see a clear improvement in regular grades average on EBC versus traditional method (see Fig. I), and a significant drop in student's number who stopped attending class regularly (Table II). These results (Fig. 2) can be attributed to the fact that EBC teachers are more aware of the knowledge development, skills and attitudes, teamwork is strengthened, and students are more involved about their own education thanks a continuous feedback. The teamwork, problem solving, groups presentations, rubrics, favors that students know those assessment areas and the level of competence developed with each of activities previously planned by the AC-UPSLP.

Another fact observed is the approved percentage of Extraordinary Exam, which is expected to be lower in the EBC, as it actually happens, than Traditional system because the EBC is more demanding. Students that no make work along the semester don't be able to pass an Extraordinary Exam, which in EBC is two parts, lab and written exam.

TABLE II. Comparison of the Pre and Post Measurements of the Control Group Students.

Method	Student´s total	Left course		Regular Approved		Not Approved		Extra-ordinary	
Traditional 2010	545	66	12.11%	127	23.30%	352	64.59%	87	24.72%
EBC 2011	660	46	6.96%	307	46.51%	307	46.51%	59	19.21%

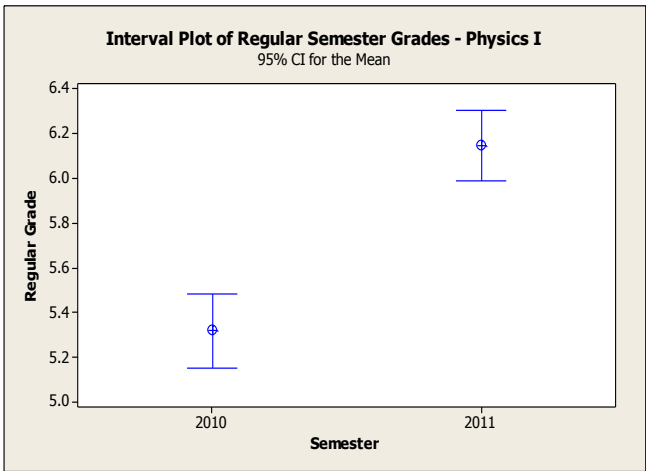

FIGURE 1. Interval graph (95% confidence) showing average grades differences between the two models.

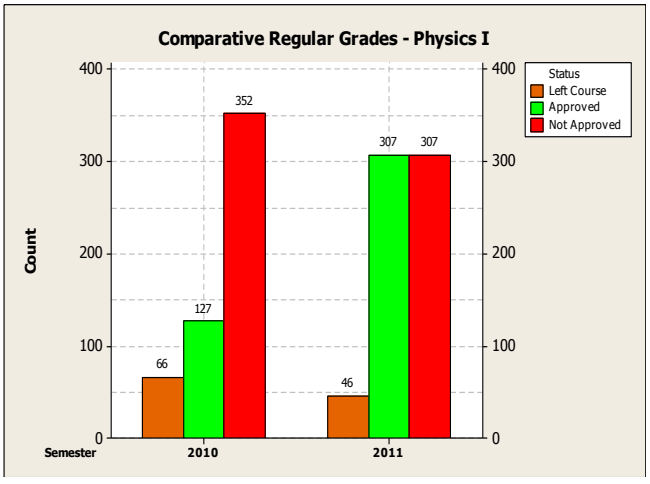

FIGURE 2. It is shown the differences between the traditional and EBC education models.

V. CONCLUSIONS

On this work presents the results of student achievement based on the experience of using a new paradigm of graduate education at a public institution of the State of San Luis Potosi. In addition to improvements in the average numbers of the new experience, we can highlight the following aspects:

1.- Teaching, learning and assessment under EBC model are ongoing processes to improve the level of skills development proposed at course beginning that impact directly on the graduate profile.

2.- Due to the above, teachers must implement strategies that promote the development of knowledge, skills, attitudes and values that the student acquires and reinforce along the course.

3.- The teacher changes his attitude from being the knowledge source to become a facilitator who help students to improve their performance standard, proposing an activities set to support certain competences aspects, so they requires become more self-critical of their work and seek improve their daily practice.

4.- Under EBC model, students show a greater commitment, becoming more active and responsible for their own learning. Finally, students are asked a greater performance level since is required the use of written and mathematical language to express their ideas as well as deepens their cognitive processes and problem-solving.

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