

Perception of Physics Teachers in Mexico About Competences Model

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This paper shows the results of a diagnostic research that evaluates physics teachers' perception of teaching competencies in universities and high schools and their experiences with the introduction of the EBC (competency-based education) due to curricular changes. The research was conducted with physics teachers in high school and college level nationally. The main purpose is to account for the way in which teachers accept or refuse the change of their teaching models as a result of the changes experienced by the traditional curriculum's conversion into a competency-based model. The main feature is that the content is linked to the productive and social sector, subjects are supported by the use of technology, and students to acquire skills and attitudes on the use and transfer of knowledge, so due to this learning to learn.

Keywords: competency model, physics learning, curriculum design

Introduction

In recent years, the educational competency model has been incorporated by higher education institutions in Mexico and worldwide. In this sense, we have made efforts to study the specific competency to be developed in different university programs for various instances, for example, the studies conducted by the Tuning Project in Europe and in Latin America, particularly, the Tuning Latin America Project degree programs in physics—studied in Chapter 4.6—in 12 countries including Mexico (Beneitone, 2007).

At other levels, we have studied the changes' progress in plans and programs, since the introduction of the competency model. In the case, for the Spanish educational model, we found interesting experiences in the physics programs at the secondary level (Cañas, Martín-Díaz, & Nieto, 2007).

The work around learning physics by this model is not new. In fact, there are efforts by the same Tuning Project (Universidad of Deusto, 2008) where they make suggestions for the design and construction of programs based on competency model. In the case of the teacher's training, there are also efforts in the area of physics; remarking the training of teachers at the National Polytechnic Institute of Mexico (National Polytechnic Institute, 2004) which is related to the institutional educational competency model dating back since 2000. This has implemented training specifically aimed at teachers of physics in understanding and implementing this model into their courses (Ramírez & Olvera, 2012). Yet, despite the mentioned efforts, the perception of physics teachers about the competency model is still bad, starting with a general ignorance of what the model is by itself. This issue has been noticed in various academic and area meetings of the AAPT

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(American Association of Physics Teachers), ICPE (International Conference on Physics Education), and WCPE (World Conference on Physics Education) (Ramírez, 2012; Ramírez & Chávez, 2012).

Methodology

The methodology used to carry out the diagnosis and evaluation of teaching skills based on EBC (competency-based educational) model in higher education institutions—methodology that has been implemented and operated by the IHE (Institutions of High Education) of Tabasco (Romero, Hernández, & Gracida, 2010)—is a typical descriptive and exploratory mixed-cut methodology. This consists of the following phases: The first phase reviews IHE’s governing documents and policies on this competency model. The first stage allowed extracting relevant and updated information about the contents that may be incorporated in the analysis and evaluation. The second stage involved determining the representative sample of the teachers in charge of operating the EBC model. The third stage is a questionnaire that was designed to investigate the ways in which the teacher faces his/her works under EBC model. The design integrates categories and units of analysis obtained from the review of the outcome documents. At the fourth stage, there was the design of instruments that were used to obtain the required information in the study including fieldwork. The fifth stage is the systematization of information. For this stage, there were creating databases and hermeneutic units for analysis and theoretical-empirical recruitment. Finally, a diagnosis-evaluation of the teaching skills in the EBC model was made, which in turn, it will be contrasted with the model proposed by regulatory agencies, such as ANUIES (National Association of Universities and Institutions of Higher Education) and the SEP (Secretary of Education) (Hernández & Rodríguez, 2008). Moreover, for physics teachers retake, the instrument used by IESs of Tabasco in a different fashion. The application was originated online at: <http://www.physics-education-ipn.com.mx/>.

The sample comprises college teachers across the country, and moreover, we also received responses from the physics teachers of the Republic of Cuba.

Analysis

For physics teachers, the results were analyzed by an interdisciplinary group of faculty. This is, there were not only physics teachers that make the analysis of the group, but also pedagogues, teachers of humanities, and mathematics teachers among others. Condensed results as well as respective created indexes are shown as follow.

Questionnaire’s replies are diverse, and they cover a wide range of possible answers which can be classified positively and negatively. These are shown in the following Tables 1 to 10, which are with answers to the questions.

Table 1
What Is Your Experience in the Knowledge of Competences?

Frequent replies	Unique replies	Positive replies	Negative replies
	No		
	Bad		
Very little-little Courses	10 4		
No difference	4		
I already know it	2		
Investigate on by my own	2		
Time in years 1.3, 3,	12	12	23
	Design schools		
	Lack of understanding concept		
	Lack of institutional support		
	Lack of curriculum		
	I do not know		

Table 2

In Your Opinion: What Is the Competencies Based Model?

Frequent replies	Unique replies	Positive replies	Negative replies
Integrator model	20		
It is the same	4	No rejection	
It is not clear	4	Achieve goals	
Develop competences with capacities	3	Not know it	29
Troubleshooting problems	2	Nonsense	10
A active student	2		

Table 3

Consider That This Model Is More Suitable for the Institution? Why?

Frequent replies	Unique replies	Positive replies	Negative replies
Yes	25		
It is integral			
It motivates students-teachers			
It makes research arises		I do not see the difference	
Not	7	I do not know	25
Is obsolete		It is early	7
let research and entrepreneurial behind			
Only activities are measured			
It is better solve problems			

Table 4

What Has Been Your Experience in Adaptation Curriculum to Competences Model?

Frequent replies	Unique replies	Positive replies	Negative replies
None yet	12		
Design	5		
Difficult, in change.	5		
Lac of information	4		
1st place, the student	3	Rejects Student 1	
The application is a slow process	3	It is easy 1	22
A few	3	No 1	22
It is good	2		
It is confusing	2		
It is incompetent	2		

Table 5

What Is the Work of University Teachers Versus Competences Model?

Frequent replies	Unique replies	Positive replies	Negative replies
Mentoring	10		
Upgrading	7		
Be aware and collaborate	5	No apply	
I do not know	4	Develop strategies	
Evaluation and Realism	3	Develop of math	31
Apply and adaptation	2	laboratory	7
Educate and integral development	2		
None	2		

What it is observed in response tables mean that two thirds do not have experience in the learning model (1), the model itself is quite accepted (2), but not as a trend (7). It is good, right (3). Some curricula have already been restructured (4). It is considered very positive for teachers (5).

There are some doubts that the change is effective (6), but it is considered to be a good adaptation effort (8).

The model has many strengths and weaknesses that are implemented by itself.

Table 10

What Are the Weaknesses of Competency-Based Education Model?

Frequent replies	Unique replies	Positive replies	Negative replies
I do not know	6		
Resistance to change	5	There is no difference	
I do not know	5	Need of good teachers	
Lack of communication		Lack of time	
between education's actors	3	It is receding. In some	
Teachers do not understand	3	countries, it have failed	
All	2	It is not covered educate plans	17
It is imposed	2	teachers	24
It is not necessary in college	2	No study of science	
Language not clear	2	Ambiguous definition	
It does not say how to		Number of students	
develop skills and evaluate	2		

Conclusions

The presented project's progress allows us to draw some preliminary conclusions:

Based on the review of available literature on EBC model, it can be said that there is not a theoretical-methodological proposition for its definition, and the existing have not reached a consensus in our country. This position largely explains the disagreements of the design and operation of the educational curricula by IES which have moved into this mode.

EBC model is a proposal that emerges labor market. From that point, competencies become teaching goals. This new dynamic means that the university must have an active and effective role in promoting a closer relationship with production structures. This is not an easy task, because there are different motivations and objectives constituting each respective agenda. For example, Cuba's teachers argue that the difference between these two bodies is mediated by a cultural problem, and they explain it in relation of what they feel it like a threat:

... The culture of the university is to value reflection, analysis, scientific research, while the company evaluates the application of knowledge to practical situations and experiences based on knowledge that is applicable to their processes.

EBC curriculum design is done by "order", because it is pointing the formation of professionals in a doomed "mode" to meet the human capital requirements of companies and employers.

EBC model requires specific competencies for its operation. But teachers, who are responsible for its operation, come from highly professionalizing rigid structures, so the implemented tasks are appreciated as a personal and individual, so this is a high subject exercise which depends on the experience for improvement.

University teachers have responded to the requirements of the model with attitude of resistance, by considering the effectiveness of their practices, or by denying their involvement in it with an open refusal to its participation. Others have adapted to the new conditions with a positive attitude—open to change. However, the study begins to outline that teachers with more seniority and teaching experience reject or resist changes for some reasons, such as discrediting and lack of agreement with the model.

When the EBC model is focusing on performance, it rejects aspects like teaching experience and the understood knowledge that the professional requires. It is clear that teachers have made interesting proposals in reflective practices. This is expressed by Schön (1998, p. 49) in his book *The Reflective Professional: How Professionals Think in Act*: "How professionals think when they act, hence the importance of recovering the

way to deal with change to suggest models for IES teachers in Mexico”.

Physics teachers seem to be more open, but they are polarized on their competency's view. An interesting situation is that many of them indicate a lack of knowledge about the model on their comments.

One more interesting situation is that teachers with wide knowledge of the EBC model manifested their inability to judge the model at this time, based on the fact of, they would like to see several generations of students—working over this model—to assess the success or failure of this educational model.

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