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Generic Competencies for Globalization from the Perspective of Engineering Students

Abstract

Within the framework of globalization, current events are diverse and heterogeneous. The General Coordination of Technological and Polytechnic Universities in Mexico (CGUTyPM) adopted a competency-based educational model with the objective of preparing professionals not only with the necessary knowledge but also with adequate skills, attitudes, and values needed in the global economy. With the aim of complementing the necessary training of future engineers, academic programs of Mexico's polytechnic universities have integrated into curricula courses in human development that address generic competencies. Development of competencies for students is complicated by the fact that within a globalized society it is necessary to learn profession-specific competencies in addition to generic competencies. However, in higher education, profession-specific competencies are commonly assumed to be of greater importance, and generic competencies are not prioritized. This paper presents the authors' research findings detailing responses from 150 students in different engineering programs. For analysis, a cross-sectional descriptive methodology was employed, using a questionnaire completed by student participants. The results show a clear need for explicit integration of the generic competencies into general curricula in particular, those of basic professional knowledge, problem-solving, commitment to ethics (honesty) and responsibility. The authors conclude that the continued teaching of the generic competencies at the university level is essential to student learning and provides students with strategies for adapting to the ever-changing environment of a labor sector situated in a globalized world.

Keywords: generic competencies, globalization, engineering students, skills, higher education

Introduction

It is time to leave behind the traditional paths of professional training and to participate in current developments in international stage in education. Higher education in Mexico is facing challenges that require a rethinking of its paradigms in teaching, learning, and evaluation due to the accelerated rate of globalization and the development of scientific knowledge, and information and communication technologies.

Standardization of professional knowledge and skills has become a challenge for educators at the international level. However, according to Delors (1996), education is not limited to the appropriation of knowledge and professional qualifications for the labor market, but rather encompasses one's general well-being, which encourages participation in social and economic life and the active development of their national character (p. 23). In this sense, the tendency that guides the educational processes is towards learning to be, to do, to know and to live together.

On the other hand, knowledge development has been exponential in recent decades (OECD, 2018) forcing the processes of learning to be throughout life, especially at higher education since knowledge can quickly become obsolete (Barrett et al., 2014). So, the basic skills of the individual should include the development of personal balance, interpersonal and relationship skills, social integration, and cognitive development, with particular attention to skills that allow learning to interpret, organize, analyze and use information.

In Mexico, education at the primary level has defined life skills (Conde, 2014, p. 32) and specific competencies for each subject and at the upper and upper secondary levels, generic and disciplinary skills are emphasized. At these levels, acting effectively in specific situations is stressed, along with flexibly and resourcefully problem-solving and relevantly adapting to context. This leads to laying the foundations of citizenship skills considered as a set of knowledge and attitudes that articulated among them, that dispose people to coexistence and peace, to democratic participation and responsibility, the appreciation and enrichment of differences within a framework of respect for human dignity, and contribution to the common good (Conde, 2014).

In a globalized world, the link between professional training and the development of generic and citizenship competencies is growing in importance. This implies an instrumental place for learning in these areas. However, a report from the Instituto Mexicano de la Juventud (2011, p. 4) noted that 18.7% of students stopped studying before reaching the age of 15, and noted that in two samples of the National Youth Survey in Mexico confirmed as a relevant cause (the second in importance) that the self-reported option “I did not like school”, was selected as a reason for dropping out. One of the main problems in the development of the generic competencies is the assumption in higher education that young people are already at a sufficient level of proficiency since they have already developed at previous levels of education. The question that guided the research was: What generic competencies prepare the student for globalization?

This document presents general results of a questionnaire that was given to a group of 150 students in different engineering education programs to gauge their perceptions of the importance of generic competencies in their training as future engineers in the framework of globalization with the aim of enriching the academic processes at the Polytechnic University of Pachuca (UPP).

Generic competencies in globalization

Globalization is about the changing nature of state relations between different communities; it is a trend toward a global free flow of goods, services, capital, workforce, and information (Blackmore, 2000 cited in Reilly, 2004). Within this context, globalization includes not only cross-border flows but also a new, shared conceptualization of reality, including growth in the areas of culture and information-exchange.

In higher education, the learning process in applied sciences should be prepared so that teaching and developing generic competencies can be linked to a real employment context and the definition of skills should be socially relevant (Ruohotie, 2006).

In this sense, engineering programs focus on the development of analysis skills; consequently, those have more importance in the acquisition of skills and competencies for decision making and problem-solving. The term generic competencies has created considerable confusion in the research literature. Male (2010, p. 18) mentions that the term is used to refer to capacities that can be applied across different job and contexts.

Employers operating in global labor markets are now looking for workers who have a broad range of skills or generic competencies. Young & Chapman (2010) explain that globalization and the rapid changes that the new economy has brought also have increased levels of demand for workers. These are alternatively labeled core skills, employability skills, life skills, soft skills, workplace competencies, and critical competencies.

Perrenoud (2011) states that a competition mobilizes declarative (describing the real), procedural (prescribing the guide to be followed) and conditional (saying at what time you must begin a specific action) knowledges. Then, what distinguishes competent people in any field is not acquired knowledge but the ability to handle it strategically. The author emphasizes that the primary purpose of competences is that they function as guides for preparation and curricular development. This serves as an instrument for comparison of educational systems, conceiving education with a holistic view; hence, the curricular design in competency based education integrates three types of competencies: basic or essential, generic or transversal and specific or technical, which must be acquired, consolidated and developed in different subjects.

The concept of generic competences described by Corminas (2001) is located in personal attributes of cognitive, social, attitudinal or valued-based character that enrich professional behavior. Strictly speaking, these are not essential for professional practice; but, in practice, they become a differentiating element, adding to the human capital of a candidate for a job or toward promotion in an existing career. It can then be understood that generic competencies are identified as general skills as well.

So different perspectives have emerged concerning competencies; the argument to sustain the importance of competencies is that the subject engages in interpretation through their cognitive structure, transforms the agreed meanings from their cultural environment, and these can lead to learning, which develops first in school and then in the world of work (Gallego, 1999).

Methodology

Hernández et al. (2010) outline the application of three types of quantitative studies: exploratory, descriptive and correlational. The first is done when the objective is to examine a topic little studied. The descriptive is carried out when it is sought to specify properties, characteristics and essential features of the studied phenomenon. The correlational seeks to uncover the relation or association that exists between two or more categories or variables in a particular context.

This research utilized the descriptive method, which allowed identifying the importance of generic competencies in professional training from students' points of view. A questionnaire with 27 Likert Scale questions was designed based on the generic competencies used by the Tunning project in Latin America to gather

information from the perspective of 150 students regarding what generic competencies prepare students for globalization.

We chose a random sample of seven different engineering education programs that were studying the subject of human development “Thinking skills” because it is a subject in the second year of study, allowing use of prior subjects data from year one.

The selection of the generic competencies based on Tuning-América Latina (2007) and institutional vision was: basic knowledge of the profession, communication skills (oral and written), problem-solving, ability to organize and plan, ability to work as a team, ethical commitment (honesty), responsibility at work, ability to learn and continuously update, motivation for work, concern for quality and improvement, ability to apply knowledge to practice and motivation to achieve goals. The instrument was validated with the Alpha Cronbach test with a result of .87, implying reliability of the instrument. The Likert scale used was: (1) not important, (2) not very important, (3) moderately important, and (4) indispensable.

Results

General demographics information of the students who answered the questionnaire reflected that 81% of the students were aged 18–20, 11% aged 21–22 and 8% over the age of 23. Regarding gender: 67% of the sample were males and 33% female. The marital status of the students was: 97.9% single, and 2.1% married.

The educational programs to which the students belong were as follows: 14% financial engineering, 10% automotive mechanical engineering, 23% mechatronics engineering, 10% telematics engineering, 17% biotechnology engineering, 16% physical therapy and 10% to software engineering.

The students’ birthplaces showed that 30% are from Pachuca, 55% from other municipalities in the State of Hidalgo, and 9% from other states in Mexico.

In order to identify the importance of generic competencies and improve student development, measures of central tendency were taken, where the mean of each competency ranged from moderately important (3) to indispensable (4). In the acquisition of generic competencies, the median and mode of each competency indicated that more than 60% of students felt the following were very important: acquisition of basic knowledge of profession, resolution of problems, ethical commitment (honesty) and responsibility at work.

The study also identified how students perceived the degree of strengthening of generic competences in the subjects of educational programs. It was observed in the average of each competence that high response rates are in the moderately important range (3) to indispensable (4) concerning the strengthening of competencies; this indicates more than 45% of students in the sample consider that generic competencies need to be strengthened during the classes.

Discussion

The advance of science and technology demands competent people not only in knowledge but also in values, skills, and attitudes, which are essential for the labor sector, and students themselves.

The results reaffirm contributions and statements such as Tait & Godfrey (1999), who mentioned that students must have a minimum level of generic and transferable skills when entering in higher education that allows independent and active learning. However, currently there may not be sufficient focus on such skills-training in classroom situations as expressed by 45% of the students in the sample who felt generic competencies need to be strengthened during classes. In addition, 67% of the sample was male, which could reflect male gender bias in engineering programs and a concomitant gender bias in interest for strengthening general skills training.

Moreover, with 60% of students indicating support, the findings suggest a great importance for developing generic competencies training at UPP in the classroom. The findings may also suggest a need to integrate such training in all educational programs in order to introduce student strategies for adapting to changes in daily life and the world of work in the future of a globalized world.

Here, it is important to consider Díaz (2006), who points out that generic competencies for social and personal life can also promote better citizenship. In our findings, student perspective confirmed the indispensable importance of general knowledge of profession, problem-solving, commitment to ethics (honesty) and responsibility in the general training of engineers and the development of better citizens.

Thus, three dimensions can be considered to strengthen engineers training: 1) as competences for citizenship and social life, for tolerance and communication; 2) personal competencies, such as honesty, enthusiasm, self-esteem, confidence, responsibility, initiative and perseverance; and 3) generic academic competencies that allow general access to culture, such as reading, writing, mathematical notions, mastery of basic concepts of science, technology, and foreign language proficiency (Díaz, 2006).

These suggestions present an opportunity and a challenge for institutions that train engineers. Students now must not only learn to participate in a local environment but also appreciate and benefit from cultural in a globalized context. As Barrett et al. (2014) and the Organization for Economic Co-operation and Development (OECD, 2018) suggest, education can shape the development of a global and intercultural outlook that unfolds in a lifelong process.

Conclusion

The findings reflect, from the opinion of 150 students, the importance of human development as a complement to technical training as engineers. Students consider that the generic competencies – in particular, those of acquisition of basic knowledge of the profession, problem-solving, commitment to ethics (honesty) and responsibility – are essential in engineering training programs.

In addition, students pointed out the need to strengthen the development of generic competencies in all curricula. This affirmation is a challenge for higher education, considering that students will need to develop curiosity, resilience, and self-regulation; they will need to develop respect for differing perspectives and values of others and to move forward in the face of adversity. It is essential that teachers become aware that students' motivations will be based on more than the promise of a high income and a good job; they will also care about the well-being of

their communities, the planet, and their general quality of life – including health, life satisfaction, social connections, civic engagement, education, and security (Howells, 2018).

The findings in this work allow the voice of engineering students to propose a challenge to the university. On one hand, these findings suggest a need to strengthen training in generic competencies throughout the university community, and on the other, to implement innovative educational strategies from teachers themselves. If UPP can respond to diverse and changing global contexts and to motivate students through appropriate teaching strategies, they will strengthen professional training for student well-being in general. Student development will then not simply be confined to the classroom, but will continue as a lifelong learning process in the complex and unequal world they will inherit.

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