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THE PERCEPTION OF PROFESSIONAL ETHICS OF ENGINEERING STUDENTS,
IN A POLYTECHNIC UNIVERSITIES IN MEXICO

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ABSTRACT

We present a quantitative, non-experimental, descriptive, cross-sectional study, with the objective of discovering the level of perspective regarding professional ethics and its application in professional exercise of students, in five study programs at Polytechnic University of Baja California (UPBC-Universidad Politécnica de Baja California). The analysis categories are social, cognitive, ethic, technical, and affective-emotional competences. In order to obtain data, we used the *Attitude Scale regarding Professional Ethics* by Hirsch Adler, based on the research methodology created by Escámez Sánchez at Universidad de Valencia, supported in the Theory of Reasoned Action by Fishbein and Ajzen (Hirsch, 2005). We analyzed a probabilistic sample of 406 students from first to ninth four-month periods in 2016-2 in Manufacture Technologies Engineering, Information Technologies, Energy, and Administration and Management of Small and Medium Companies (Pymes). The data was processes in the Statistic System for Social Sciences (SPSS). The results showed a high perception in the competences analyzed.

KEYWORDS: Professional Ethics, UPBC, Students, Technical College, Competences

INTRODUCTION

The higher education system in Mexico is formed by subsystems (Ortega y Casillas, 2014) where Technical Colleges (UP) derive from and are currently under the charge of the General Coordination of Technological and Polytechnic Universities (CGUTYP) of the Ministry of Public Education and seek the training of professionals through real situations and new ways of teaching-learning so the students acquire the capacities that will lead them to learn and update through life (CUP, 2009). The education model based on competences centers in performance evidence through the effort of teachers and students, prioritizing the commitment in the training of professionals capable of combining theory and practice in order for their university training to allow them to develop on a high scale of ethic and moral values in our society (CUP, 2009).

In the state of Baja California, the Polytechnic University of the State of Baja California (UPBC) is a public, decentralized from the government organism build through the signing of a coordination agreement in 2006 (Official Gazette of the Baja California State, 2006) and offers academic programs such as: Engineering in Manufacture Technologies, Energy, Information Technologies, Animation, and Visual effects, and Administration and Management of Small and Medium Companies (Pymes), and recently started offering a Masters Science Teaching (UPBC, 2017). The study seeks to provide a proposal of moral training for students in the Universidad Politécnica de Baja California, who needs to reassert its course through a strategic, efficient, and effective planning regarding the topic of professional ethics and the way in which the perspective of each student is assimilated from their perspective, and centered in their profession.

The proposal of moral training includes the phases that build the professional ethics scale based on the methodology created by Juan Escámez Sánchez, PhD., of the Universidad de Valencia, in coordination with Rafaela García López, PhD., and supported by the Theory of Reasoned Action by Fishbein and Ajzen, and its theoretical foundation conceives the human being as a rational being that uses information to judge, evaluate, make decisions, thus, a interrelation is established between ethic, social, cognitive, affective, and behavioral factors that take part in the training and the change in men attitudes, considered when building a technological model to predict the change of conduct through the modification of beliefs or informative base, that lies behind the attitudes and subjective rules that condition, determine the intention of behavior, and behavior itself (Hirsh, 2005).

OBJECTIVES OF THE STUDY

The study's general objective is to describe the level of perspective regarding professional ethics and its application in the professional exercise of students enrolled in the careers of Engineering in Energy, Mechatronics, Manufacture Technologies and Information Technologies, and Administration and Management of Small and Medium Companies at Universidad Politécnica de Baja California, which to know their critical thinking through reflection regarding the possible moral-ethical conflicts that may appear in their work area.

CONCEPT DEFINITION OF PROFESSIONAL ETHICS

Talking about ethics is talking about the rule that says a person is granted to himself based on reflection, the analysis of values, and the options presented making a consideration originated in the interior and comfort of human conscience, and it is approached as science that presents a paradigm because it is concerned in presenting a human behavior model, constituting itself in such model through reason (Gutiérrez, 2006). On the other hand, Sánchez (2006) defines it as the science of morals and part of the human conduct, thus, its proposals have the same exactitude, coherence, and founding as the scientific proposals and, therefore, it is worth talking about scientific ethics.

In postmodernism, science and the power of men have developed dangerously for incoming generations in the development of atomic and genetic energy. Ethics is updated by men well-being and their survival on a first order public context; the need to institutionalizing ethics is asserted, which presents more advancements in North America in the fields of biology, medicine, and technical. In the economic field, big companies have had to suffer notable losses in order to realize that it is not viable to ignore the ecological, political, and ethic implications of their products against those that respect and privilege them, avoiding, in this way, fines and limitations (Küng, 2006).

Ethics is a dimension that must be linked to knowledge and training of students in order for them to exercise it in benefit of society, which is a critical situation for engineering students, since their decisions affect people and the ecologic environment. Nowadays, we can see the need of providing an education in ethic training for professional life involving the ethic dilemmas in our daily life for a knowledge society with better people (Rodríguez, Ramírez & Ramírez, 2015). It is important to promote the reflection in students through ethic dilemmas of the profession that allow them to generate ethic values and train an ethic view, promoting the commitment so they can acquire a sense of decision-making that considers the social en economic environment in the future (Echeverría, 2013).

The term profession is defined (Gutiérrez, 2006) as the personal, stable, and honest activity in service of others and in own benefit with the corresponding dignity of a person. The goal of professional work is the common well-being; without this horizon and objective, a profession transforms into a means to profit or honor, or simply into the instrument of

the subject moral degradation; his moral capacity gives him a higher importance to his work, makes him look, not only like a professional, but also like a person out of his work environment.

In order for professionals to make a responsible use of their knowledge and contribute to the construction of a more fair society, Boni and Lozano (2005) think that, we should train them for it, since moral matters are not learned spontaneously; it is necessary to reflect on what, being a professional implies and what role the moral values play in the excellent exercise of a professional; they define professional as the person who possesses theoretical knowledge usable when solving key problems and feels the obligation of doing their jobs to the fullest of their competences. Regarding this, Savater (1993) argues that moral reflection is not a specialized matter for those who wish to take higher philosophy studies, but an essential part of any education worthy of that name.

Globalization has made wealth grow, the new information and communication technologies have caused the surging of a new social mentality; societies need a supportive drive aimed to promote the human resource as the most valuable resource that we have in society and authentic capital that is boosted, guaranteeing, to the people, a truly autonomous future; thus, ethics surges in the conscience after an interior reflection of each person and tries to enlighten, with practical reason, the decisions that the subject must take (Echeverría, 2013).

The profession is also defined from the subjective point of view based on the perspective of the one who practices it, since, when exercising it, some personal dispositions transform through their work, linking to society, providing professionals with a sense of belonging. The objective point of view regarding the environment, in which their activities are developed, refers to the need for a large preparation for the acquiring of competences, academic degrees and features as exclusive dedication, social recognition, and professional autonomy (Navia & Hirsch, 2015).

The professional activities are a group of techniques learned during the career, and in order for it to assure being a good professional, it is essential to have internal goal, values, virtues, and principles that are typical of the profession exercise in relation to citizens; it is characterized as a cooperative social activity that provides a specific and essential good for its survival as human society, and it incarnates values and principles (Bolívar, 2005).

Professional ethics in the XXI century is characterized by the speed in the life rhythm and the discredit of stable principles, the practices are changing and dynamic, the professional identities weaken, and the disciplinary borders crumble; the current problem is that ethics of principals is an ethic that surges from stable rules or moral criteria. The four basic principles of professional ethics are beneficence, non-maleficence, autonomy, and justice: they are applicable in the social environment in which, these professional practices are aimed from the search for efficiency and competitiveness, and from the objective of individual profiting as criteria that rules decisions (Yuren, López, Hirsch, Pérez & López, 2013).

Professional ethics is an applied ethics (Gutiérrez, 2006) because, it possesses its own reference frame, specific values, and particular experiences. Professional ethics is the search to qualitatively and systemically improve the grade of humanization of the social and industrial life through the exercise of profession, interpreted as the correct performance of its own activity in the social context in which humans develop (Navia and Hirsch, 2015). According to Yuren, *et al.* (2003), professional ethics is still in the context of the official speech, since the studies carried out in Mexican universities indicate that it is still a pending task, since, in the work and social spots where professionals act, there have been ethically questionable incidents. According to Yuren, *et al.* (2013), these problems are explained by the scarce ethics

in the political environments where the decisions are made mostly by people who have university degrees and distance from a socio-moral behavior with those who made their university training possible, decreasing commitments to the social body and its problems, which affects public life. Professional ethics, as a knowledge field, gains academic importance and grows as a way to make the university work more legit and moral. Professional ethics is pointed out by Hirsch (2005) as a systemic search to qualitatively improve the humanization grade of social and individual life through the exercise of profession, understood as the good performance of the own activity in the social context in which it develops, where men find the means to increase the humanization grade of personal life.

METHOD

The method of study is quantitative, non-experimental, cross-sectional, and descriptive. The analysis categories considered were social, cognitive, technical, affective-emotional, and ethic competences. In order to obtain data, we used, as base, the *Scale of Attitudes regarding Professional Ethics*, applied by Ana Hirsch Adler, PhD., based on the research methodology created by Juan Escámez Sánchez, PhD., at Universidad de Valencia, supported by the Theory of Reasoned Action by Fishbein and Azjen (Hirsch, 2005). The scale was adjusted to 34 questions. The analysis subjects were bachelor's degree students from first to ninth four-month periods in 2016-2 at Universidad Politécnica de Baja California, we considered students from Engineering in Manufacture Technologies, Mechatronics, Information Technologies, Energy, and Administration and Management of Small and Medium Companies (PYMES). The data was processed in the Statistic System for Social Sciences (SPSS). The total student population enrolled in this school term was 1600. The sample was probabilistic, we calculated with a trust level of 95%, an acceptance error of 0.402, the size of the sample was 406 students: 131 students from Engineering in Manufacture Technologies, 109 from Mechatronics, 68 from Information Technologies, 58 from Energy, and 40 from Administration and Management of Small and Medium Companies (Pymes) (Hernández, Fernández, and Batista, 2010).

RESULTS

The descriptive results of the analysis are presented regarding the students perception, by type of cognitive and technical competences; social competences; ethic and affective-emotional. The data corresponds to 406 surveys applied to students in the careers of Manufacture Technologies Engineering, Mechatronics Engineering, Information Technologies Engineering, Energy Engineering, and Administration and Management of Small and Medium Companies (PYMES). The analysis of the results from the research showed positive percentages of perceptions in relation to each item contained in the instrument. The information corresponds to data obtained from the survey applied to students at Universidad Politécnica de Baja California in the school term 2016-2. The general data presented is: gender and age of participants; likewise, we describe the total data of the students' perception in technical, social, ethic, and affective-emotional competences.

GENERAL DATA

Gender of the Participants

We had the participation of 80.8% (328) male students and 19.2% (78) female students. 96.3% (105) of men coursed the career of Mechatronics Engineering with 105 surveys, followed by 88.2% (60) that coursed the career of Information Technologies Engineering, and 82.8% (48) in Energy Engineering. The data from the female gender obtained a higher percentage in the Bachelor's degree in Administration and Management of PYMES 52.5% (21),

followed by Engineering in Manufacture Technologies with 26.7% (35) (see *Table 1*).

Table 1: Students Participating

Career Studied	Gender of the Students			
	Male		Female	
	Num.	%	Num.	%
Engineering in Information Technologies	60	88.2	8	11.8
Engineering in Energy	48	82.8	10	17.2
Engineering in Mechatronics	105	96.3	4	3.7
Engineering inManufacture Technologies	96	73.3	35	26.7
Administration and Management of PYMES	19	47.5	21	52.5
Total	**328**	**80.8**	**78**	**19.2**
Num.= number, Per.= Percentage				

Age of the Participants

The results show that the dominating age range is less that 25 years in the Bachelor's degree in Administration and Management of PYMES with 87.5% (35), followed by 69.7% (76) of the Engineering in Mechatronics (see *Table 2*).

Table 2: Age of the Student by Age and Career

Career Studied	Less than 25 Years		From 25 to 35 Years		From 36 to 45 Years		From 46 to 55 Years		More than 55 Years		Total	
	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.
Engineering in Information Technologies	45	66.2	20	29.4	3	4.4	0	0	0	0	68	100
Engineering in Energy	39	67.2	14	24.1	5	8.6	0	0	0	0	58	100
Engineering in Mechatronics	76	69.7	30	27.5	3	2.8	0	0	0	0	109	100
Engineering in Manufacture Technologies	55	42	52	39.7	21	16	3	2.3	0	0	131	100
Administration and Management of PYMES	35	87.5	3	7.5	2	5	0	0	0	0	40	100
Total	**250**	**61.6**	**119**	**29.3**	**34**	**8.4**	**3**	**0.7**	**0**	**0**	**406**	**100**
Num.= number, Per.= Percentage												

Technical Competences

The results obtained referring to *technical competences* through the attitudes of professional ethics show that 50% (203) of students agrees to be limited to only develop techniques to perform a good professional exercise (see *Table 3*).

Table 3: Perception of Technical Competences of Students at
Universidad Politécnica de Baja California. School Term 2016-2

Proposal	Totally Disagrees		Partially Disagrees		Neutral		Partially Agrees		Agrees		Total	
	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.	Num.	Per.
Perception of the students about limiting themselves to develop technical abilities	7	1.7	11	2.7	51	12.6	134	33	203	50	406	100
Num.= number, Per.= Percentage												

Social Competences

The *social competences* refer to socio-cognitive abilities and strategies. The social interaction includes comradeship and relations, communication, teamwork, and performing work activities. Regarding this, we describe the data of three main proposals: *I like that my classmates positively value my good treatment to other people, the solution to social problems is a technical issue that makes it unnecessary to listen to citizens, and I consider that I can solve important professional issues by listening to others*. On the proposal 'I lie that my classmates positively value my good treatment to people', most of the students 61.3% (249) answered they agree, followed by 23.4% (95) who indicated they partially agree. 28.82% (117) were neutral regarding the solution where social problems are a technical issue that makes it unnecessary to listen to citizens, 26.35% (107) indicated they totally disagree (see *Table 4*). On the other hand, 50.7% (206) of students consider they can solve important professional issues by listening to others, followed by 33.7% who indicated they partially agree (see *Table 4*).

Table 4: Perception of Social Competences Students at Universidad Politécnica De Baja California

	School Term 2016-2.											
Proposal	**Totally Disagrees**		**Partially Disagrees**		**Neutral**		**Partially Agrees**		**Agrees**		**Total**	
	Num.	**Per.**	**Num.**	**Per.**	**Num.**	**Per.**	**Num.**	**Per.**	**Num.**	**Per.**	**Num.**	**Per.**
I like that my classmates positively value my good treatment to other people	8	2	6	1.5	48	11.8	95	23.4	249	61.3	406	100
the solution to social problems is a technical issue that makes it unnecessary to listen to citizens	107	26.35	49	12.07	117	28.82	75	18.47	58	14.29	406	100
I consider that I can solve important professional issues by listening to others	3	0.7	8	2	52	12.8	137	33.7	206	50.7	406	100
Num.= number, Per.= Percentage												

Ethic Competences

The ethic competences involve a perspective that allows students to choose between valuable options, make decisions, and face conflicts; learning achieved by development of competences can be generalized to multiple situations and enrich the students' view of the world and themselves. On ethic competences, the results of the following proposals are described: importance of confidentiality in the professional exercise, the duty of earning the trust of people for whom they work by acting honestly, there are ethic decisions so important in the exercise of profession that they cannot be left just to the criteria of organizations, as long as science and technology keep advancing it is not necessary to worry about the consequences, ethic training can be necessary to face conflicts in professional work, and ethical aspects can be essential in the exercise of profession.

73% (298) of students answered they agree that confidentiality is important in the professional exercise. 78.57% (319) agrees that they must earn the trust of people for whom they work by acting honestly. 4.64% (165) indicated they agree that there are ethic decisions so important in the exercise of profession that they cannot be left just to the criteria

of organizations, followed by 35.22% (143) that partially agreed. 51.97% (211) totally disagreed that as long as science and technology keep advancing it is not necessary to worry about the consequences. 57.39% (233) agreed that ethic training can be necessary to face conflicts in professional work. Lastly, 43.10% (175) agreed that ethical aspects can be essential in the exercise of profession, followed by 33.25% (135) that partially agreed. (see *Table 5*).

Table 5: Perception of Students' Ethic Competences at Universidad Politécnica de Baja California

Proposal	Totally Disagrees		Partially Disagrees		Neutral			Partially Agrees		Agrees		Total	
	Num.	Per.	Num.	Per.	Num.	Per.		Num.	Per.	Num.	Per.	Num.	
Confidentiality is important in the professional exercise	8	1.97	2	0.49	29	7.14	69	17	298	73.4	406	100	
I must earn the trust of people for whom they work by acting honestly	5	1.23	5	1.23	18	4.43	59	14.53	319	78.57	406	100	
There are ethic decisions so important in the exercise of profession that they cannot be left just to the criteria of organizations	5	1.23	12	2.96	81	19.95	143	35.22	165	40.64	406	100	
As long as science and technology keep advancing it is not necessary to worry about the consequences	211	51.97	62	15.27	67	16.5	42	10.34	24	5.91	406	100	
Ethic training can be necessary to face conflicts in professional work	3	0.74	5	1.23	59	14.53	106	26.11	233	57.39	406	100	
Ethical aspects can be essential in the exercise of profession	10	2.46	12	2.96	74	18.23	135	33.25	175	43.1	406	100	

Affective-Emotional Competences

The affective development is one of the main aspects of the person, since it is linked to the rest of the manifestations of the human being, such as social relations, personality, sexuality, emotions, and are present in every aspect of our life, thus, the creation of affective relations during the professional development is really important. In this sense, the perception of students showed that 63.3% (406) agree not to make important professional decisions before measuring the consequences, followed by 34.4% (257) that partially agreed (see *Table 6*).

Table 6: Perception of Affective-Emotional Competences of Students at Universidad Politécnica de Baja California

Proposal	Totally Disagrees		Partially Disagrees		Neutral			Partially Agrees		Agrees		Total	
	Num.	Per.	Num.	Per.	Num.	Per.		Num.	Per.	Num.	Per.	Num.	
I must not make important professional decisions before measuring the consequences	8	2.0	12	3.0	30	7.4	99	34.4	257	63.3	406	100	
Num.= number, Per.= Percentage													

CONCLUSIONS

The world that we live in is complicated, but, in that diversity, resides the capacity to adapt to constant changes that we face: institutions of higher education such as Universidad Politécnica de Baja California, which challenge is the training of professionals, to implement and develop processes, and the creation of different education techniques and courses that let us search for non-sudden changes, but derived from a scientific and valid construction that can be useful and beneficial for society and out environment.

The discoveries of this research, regarding professional ethics from the UPBC students' perspective, showed the perception of a high level of ethic competences, which is essential in the process of change on work culture that can be useful and benefit the community.

We identified a high level of perception in technical competences, which leads us to consider the benefits that translate into the critical analysis of students at the time of providing their opinion into each of the proposals, which leads us to consider that the result showed by the method used to measure their opinion is effective and beneficial.

Regarding the students' opinion about social competences, it was perceived as high and positive, distinguishing the way of relating to co-workers in an appropriate way, the *gift with people* understood as the qualities of a person to be social in the treatment to other people and the ease of persuasion or convincement, as well as human treatment, the capacity of meditation and availability; in addition to significant characteristics such as comradeship and relations, communication, teamwork abilities, being laborious; a competence from which relevant information was obtained.

On the other hand, when evaluating affective-emotional competences of students at Universidad Politécnica de Baja California, and according to the results, the perception and analysis is measured as really high, which takes us to determine that UPBC students are conscious of the need to reinforce their technical knowledge, without neglecting the reinforcement of the personality in that aspect every time society faces sudden changes, such as work instability and lack of perks, since our society changes on a fast rhythm.

The result of this study showed that the student community can be capable of facing ethic dilemmas presented on their exercise of profession, for the results showed a high level of ethic competences on students at Universidad Politécnica de Baja California, taking into account that responsibility, honesty, professional and personal ethics, the importance of acting while trying to offer the best service for society, respect, and acting morally and with professional values are essential matters in the process of change in the culture of a community, whether it focuses on the social, work, or family environment, which results useful and beneficial for society.

Derived from the excellent results showed by the analysis, it is recommended to research on the subject of professional ethics in other higher education institutes, inviting them to privilege practices that improve its reinforcement.

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