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Artículos Científicos

Las habilidades blandas en estudiantes de ingeniería de tres instituciones públicas de educación superior

Soft Skills in Engineering Students from Three Public Higher Education Institutions

Soft skills em estudantes de engenharia de três instituições públicas de ensino superior

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Resumen

El objetivo del presente artículo fue analizar la percepción que tienen los estudiantes de ingeniería en relación con la adquisición de habilidades blandas obtenidas en el transcurso de sus carreras. La obtención de los datos se realizó por medio de la construcción de un cuestionario con escala tipo Likert. Se utilizó el análisis factorial y las pruebas estadísticas de Kruskal-Wallis y los modelos lineales generalizados. Es un estudio transversal; la muestra fue de 3560 jóvenes de tres universidades públicas: dos ubicadas en la Ciudad de México y una en el País Vasco, España. Como parte de los resultados, los estudiantes de la Escuela de Ingeniería de Bilbao, en el País Vasco, obtuvieron las mayores puntuaciones en relación con las habilidades blandas; le siguieron las universidades mexicanas. Además, se halló que tanto en el Instituto Politécnico Nacional (IPN) como en el Tecnológico Nacional de México (TecNM) se



deben reforzar los saberes relacionados con este tipo de habilidades, particularmente en las ingenierías en informática y de tecnologías de la información y comunicación. Por último, los jóvenes del IPN que se encuentran trabajando son los que registraron más puntos en las también llamadas *soft skills*. Se concluye que las instituciones de educación tienen que trabajar en la implementación de talleres que refuercen las habilidades blandas, así como mantener el acercamiento con el sector empresarial que continúe impulsando las estancias, ya que estas coadyuvan al fortalecimiento de las competencias interpersonales de los estudiantes.

Palabras clave: carreras de ingeniería, habilidades blandas, habilidades de un ingeniero, universidades.

Abstract

The objective of this paper was to analyze the perception that engineering students have regarding the acquisition of soft skills achieved in the course of their studies. The data was obtained through of the construction of a questionnaire with a Likert-type scale; factor analysis, Kruskal-Wallis statistical tests and generalized linear models were applied. It is a cross-sectional study; the sample was 3560 young people of three public universities: two of them located in Mexico City, and one in the Euzkadi Country, Spain. It was found that the students of the Escuela de Ingeniería de Bilbao, in the Basque Country, obtained higher scores in relation to soft skills; Mexican universities were behind. In addition, it was found that in both the Instituto Politécnico Nacional (IPN) and the Tecnológico Nacional de México (TecNM) the knowledge related to soft skills must be strengthened in computer engineering and in information and communication technologies studies. Finally, young people at IPN who are also working gave higher scores to soft skills. It is concluded that educational institutions have to work in the implementation of workshops that reinforce soft skills and maintain closeness with the business sector to allow for boosting stays, since these contribute to strengthening the interpersonal skills of students.

Keywords: engineering careers, soft skills, skills of an engineer, universities.

Resumo

O objetivo deste artigo foi analisar a percepção que os estudantes de engenharia têm sobre a aquisição de habilidades sociais obtidas durante a carreira. Os dados foram obtidos por meio da construção de um questionário em escala do tipo Likert. Foram utilizados análise fatorial, testes estatísticos de Kruskal-Wallis e modelos lineares generalizados. É um estudo transversal; A amostra foi de 3.560 jovens de três universidades públicas: duas localizadas na Cidade do México e uma no País Basco, Espanha. Como parte dos resultados, os alunos da Escola de Engenharia de Bilbao, no País Basco, obtiveram as pontuações mais altas em relação às habilidades sociais; Universidades mexicanas seguiram. Além disso, verificou-se que o Instituto Politécnico Nacional (IPN) e o Instituto Tecnológico Nacional do México (TecNM) devem reforçar o conhecimento relacionado a esse tipo de habilidades, particularmente em engenharia da computação e tecnologia da informação e comunicação. Finalmente, os jovens do IPN que estão trabalhando são os que registraram mais pontos nas chamadas habilidades sociais. Conclui-se que as instituições de ensino devem trabalhar na implementação de oficinas que reforcem as habilidades sociais, bem como manter a abordagem junto ao setor empresarial que continua promovendo as estádias, uma vez que estas contribuem para o fortalecimento das habilidades interpessoais dos alunos.

Palavras-chave: carreiras de engenharia, soft skills, habilidades de um engenheiro, universidades.

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Introduction

Countries that are concerned with providing opportunities for the development of competencies that are considered important for sectors of society allow creating the conditions for increased productivity and economic development of their nations, since they recognize that having human talent Able to enter and grow professionally in the job market helps organizations achieve progress and well-being for the individuals who work in them. Therefore, the acquisition of skills is one of the fundamental pillars for the growth of countries and the well-being of citizens.

Along these lines, according to Ibarra, Ripani, Taboada, Villa and Garcia (2014), there is evidence that soft skills increase employability. And of course, they allow improving job performance.



In the labor market, employers look for people who are trustworthy, creative, with effective communication, with initiative, who are disciplined and who demonstrate a positive attitude (Majid, Liming, Tong & Raihana, 2012). Furthermore, the labor sector often complains that higher education graduates do not have the skills to develop certain jobs (Taylor, 2016).

For their part, higher education institutions have a responsibility to ensure that young people are acquiring the necessary skills for the labor market. In fact, the employability of graduates has become a quality indicator for many universities (Lennox and Roos, 2017). According to Retnanto, Parsaei, and Parsaei (2019), schools that offer engineering programs require strengthening social skills in students. However, another problem that universities and their professors face is that they do not have a clear way of evaluating soft skills.

Particularly, in engineering schools students spend more time honing their technical skills and sometimes neglecting skills that allow them to solve other problems. Given this, it is necessary to know the forms that they most appreciate and the ones that generate the most enthusiasm in students when it comes to learning (Kumar and Hsiao, 2007). Social skills are crucial for engineers, since the work environment in which they are developed is increasingly interdisciplinary and demands more collaborative work (Berglund y Heintz, 2014).

In this regard, Florea and Stray (2018) analyzed job advertisements in 33 countries and found that companies want to hire engineers who are able to communicate, possess analytical skills, and solve problems. They also found that there are new categories of soft skills like work ethic, customer focus and knowing how to work under pressure.

The objective of this article is to analyze the perception that engineering students have in three public universities, two located in Mexico City and one in the Basque Country, in Spain, in relation to the soft skills they have managed to acquire during their transit in the race. The above to recognize the scenarios on which each of the schools is with respect to the phenomenon already specified, and thus identify areas of opportunity for future engineers.

The research was carried out in three higher education institutions, two Mexican and one Spanish, as already mentioned. Regarding the Mexican women, it was decided to work with the National Polytechnic Institute (IPN) and the National Technological Institute of Mexico (TecNM) because both are nationally recognized

for teaching careers in engineering and for their geographical location; the two agreed to participate in the study. In the case of the school in Spain, we worked with the University of the Basque Country, considered among the 500 best universities in the world, and specifically with the Bilbao School of Engineering, which agreed to collaborate.

Soft skills

Aligning higher education to the needs of the labor market increases the capacities that determine student success and employability (Cleary, Kerrigan, and Van Noy, 2017). Here he agrees with Fadel and Groff (2019) when they mention that schools have to promote an education that supports forging the character of young people so that they acquire and strengthen virtues, values and an ability to make decisions to lead a balanced life, even Mental health, curiosity, resilience, ethics, and leadership must be taught.

Soft and social skills are of great value to young people as they are related to job performance and professional development. Furthermore, interpersonal skills help those people whose work demands to adequately manage the emotional aspect to maintain a healthy relationship with clients. In addition, they provide management and leadership skills to support work teams to achieve their goals.

Also known as transversal competences, they refer to personal traits that help increase positivity and improve relationships between people. Likewise, these competences allow knowing how well people know each other and their ability to manage themselves. This is related to personal development that involves emotional, behavioral and cognitive components, without neglecting emotional and social intelligence (Dell'Aquila et al., 2017).

Following Dell'Aquila et al. (2017) and Lennox and Roos (2017), soft skills or interpersonal intelligence are those that allow the creation and development of positive relationships with others, in addition to being key competent in positive conflict resolution. As already mentioned above, intrapersonal intelligence is related to the understanding that subjects have of themselves: whoever has this developed intelligence is more likely to know and recognize personal feelings, fears and motivations. This has to do with introspection and self-reflection that contributes to self-awareness.

For their part, Pieterse and Van Eekelen (2016) point out that it is possible that interpersonal skills are an important element to obtain a job, as well as that this type of competences allow people to be convinced that they may be able to progress and succeed

In the organization. In the world of organizations, communication, management, planning, teamwork, collaboration and interpersonal relationships are valued.

Robles (2012) it lists the 10 most relevant soft skills in the work context: integrity, communication, courtesy, responsibility, social skills, positive attitude, professionalism, flexibility, teamwork and work ethic. Soft skills have more to do with people than with the knowledge they possess. For these reasons and more, soft skills should be considered as an investment.

This set of skills includes all those that are valuable in work environments, support the behavior of individuals in their employment, although, for the same reason, they are difficult to measure. It should be specified that they should not be confused with values, beliefs, traits and behaviors (Matteson, Anderson & Boyden, 2016).

It is equally important to emphasize that soft skills support young people to build their confidence so that they can better function in work settings. Furthermore, when young people have the opportunity to gain experience in the workplace and apply soft skills, they gain more prospects for their profession. These kinds of skills allow people to face the challenges of life. They are also predictors of success in life, but this depends on personality traits, such as awareness, perseverance, sociability, and curiosity. Abdullah-Al-Mamun (2012) says that these traits are not related to intelligence.

According to Rao (2014), soft skills are known as life skills, interpersonal skills, employability skills and emotional intelligence. These are skills that contribute to success in life and in the world of work. And they can be learned in a training environment. However, when support is lacking, skills that have already been acquired may be lost (Gibb, 2014). In this regard, Taylor (2016) stresses that these are valuable but that they are difficult to teach. It complements that they are related to emotional intelligence, positive attitude, willingness to learn and self-management of time.

Bailly and Léné (2012) point out something interesting: soft skills are those that have to do with the personality of the employee such as enthusiasm, empathy with customers and the ability to have social interaction, and are considered innate to individuals; however, there is a perception that this is a new form of discrimination at the time of employment. While Balcar (2014) comments that soft skills are intangible skills that are complex to measure and are linked to the attitudes of the individual. Be that as it may, they are skills that have a positive relationship with people's salary levels.

Finally, Rao (2014) point out that soft skills are supported by hard skills. The combinations of knowledge allow leaders capable of influencing people to be developed; leaders who manage and manage uncertainty; they know how to use time appropriately and delegate easily; they know the ways to align efforts; in short, they are capable of learning and growing continuously and achieve organizational objectives.

Materials and methods

The study in question here is quantitative and cross-sectional. The research worked with three public higher education institutions, two of them located in Mexico City and the other in Spain. At the time of the selection of the schools they influenced the fact that they had engineering degrees and that they were willing to participate in the study. In the Mexican case, the IPN participated, first, through the Interdisciplinary Professional Unit of Engineering and Social and Administrative Sciences (Upiicsa); The careers that represented this institution were Transportation Engineering, Industrial Engineering and Computer Engineering. The second institution was TecNM, through the Technological Institute of Gustavo A. Madero, through engineering in Information and Communication Technologies, in Business Management, in Logistics, Industrial and Environmental engineering. Finally, from the School of Engineering of Bilbao, located in the Basque Country, the participating degrees were Environmental Engineering, Engineering in Industrial Organization, Engineering in Industrial Technology, Electrical Engineering, Industrial Electronics and Automatic Engineering, Mechanical Engineering, Engineering in Telecommunications Technology, Civil engineering and Engineering of Mining and Energy Technology. The subjects' ages ranged from 18 to 24 years; the average age was 21.66 years.

The sampling used was for convenience: for the proximity and ease of the subjects. In total there were 3,560 questionnaires: 2,130 are young people from the IPN, 500 from the University of the Basque Country and 930 from the TecNM. The data was collected through the construction of a questionnaire that has 18 statements, which measure the perception regarding the acquisition of soft skills. Likewise, a list of 25 competencies was included and the participants were asked to choose five of these that they considered relevant in the training of engineers. A Likert-type scale was used, where 1 = Never, 2 = Almost always, 3 = Sometimes, 4 = Almost always and 5 = Always. The instrument was piloted in one of the IPN units, with a sample of 60 young people. The data was processed with the Statistical Packet for the Social Sciences (SPSS-IBM)

software. The reliability of the instrument gave a Cronbach's alpha of 0.863, which indicates that the statements demonstrate internal consistency. In addition to this, an exploratory factor analysis was carried out. Statistical tests gave a Kaiser-Meyer-Olkin of $0.940 > 0.50$, which means that the items have the ability to be grouped into dimensions; we only worked with a factor that integrates soft skills. It is important to mention that the decision was made to use the factor analysis method since it allows studying large amounts of data. The extraction was by means of the main components and the rotation was varimax (see table 1). For the application of the instruments, in the case of Mexico, young research assistants were trained; in Spain, the questionnaires answered were the result of a research stay. During the application of the questionnaire, it was emphasized that the confidentiality of the informants would be protected.

The first part of the questionnaire includes the contextual variables: gender, age, school, career, average, shift, failed subjects, ways of learning, the perception of how much a graduate earns, the semester, the reason of attendance, if you currently have a job, if you have a scholarship, the language, the schooling and trade of the father and the schooling and trade of the mother.

Tabla 1. Análisis factorial, componentes rotados

Variable. Factor uno, habilidades blandas	Coefficiente de correlación	IPN. Promedio por ítem	Escuela de Ingeniería de Bilbao. Promedio por ítem	TecNM. Promedio por ítem
Crees que te puedes comunicar de manera eficaz con tu entorno.	0.631	3.70	3.85	3.59
Consideras que eres flexible al cambio de un proceso o forma de trabajo.	0.604	3.85	3.72	3.67
Consideras que procesas información de manera rápida y eficaz.	0.604	3.62	3.78	3.38
Consideras contar con la habilidad para resolver conflictos.	0.571	3.84	3.81	3.60
Capacidad para trabajar en equipo.	0.557	3.73	3.65	3.61
Piensas que afrontas los retos con facilidad.	0.556	3.67	3.75	3.61
Capacidad para tener nuevas ideas, alternativas y soluciones.	0.556	4.03	3.88	3.76
Capacidad para separar lo personal de lo laboral.	0.523	3.62	4.09	3.66
Retroalimentación de tus errores para poder corregirlos.	0.519	3.79	3.97	3.60
Realizas autocríticas y/o autoanálisis continuos para seguir mejorando como persona.	0.511	3.92	3.98	3.71
Consideras que te relacionas con facilidad.	0.508	3.68	3.87	3.47
Te consideras persuasivo e influyente en las decisiones de las demás personas.	0.507	3.32	3.51	3.20
Consideras que cuentas con iniciativa y decisión en la resolución de problemas.	0.504	3.63	4.06	3.45
Te mantienes informado acerca de las tendencias del mercado laboral.	0.502	3.61	3.70	3.40
Reaccionas con calma a situaciones de adversidad	0.458	3.32	3.33	3.31

Piensas que le das a los medios electrónicos el máximo aprovechamiento dentro de tu área de estudio y/o laboral.	0.431	3.56	3.57	3.46
Consideras que cuestionas las ideas tanto propias como de la gente que te rodea.	0.427	3.48	3.85	3.52
Creas que el aprendizaje obtenido te ayuda a fortalecer tus actitudes de liderazgo.	0.323	3.66	2.93	3.64

Fuente: Elaboración a partir de los datos obtenidos del software SPSS

It is a cross-sectional study. The data collection was carried out in the months of May, June and July 2018. In the case of Mexico, young people who supported the application of the questionnaire were trained; in the case of Spain, the instruments were made thanks to a research stay. The statements were constructed from the literature and allow analyzing the perceptions of young people in relation to obtaining soft skills.

The assumptions that were established were:

- a) There are differences or similarities between the perceptions of the students in relation to the soft skills obtained from the three participating schools.
- b) There are differences in relation to the soft skills factor and the contextual variables of the generalized linear model made up of the variables of gender, career, failed subjects, learning, how much a graduate earns and the reason for attendance.
- c) There are differences in relation to the soft skills factor and the contextual variables of the generalized linear model consisting of current work activity, scholarships, languages, schooling and job of the father, schooling and job of the mother, job of the dad and job of the mother.

Factor analysis was performed to identify the grouping ability of the statements. In addition, this type of statistical tests allow studying large amounts of data. The Kruskal-Wallis test, a non-parametric test for independent samples, was used to determine the equality or difference between the groups. Similarly, it was decided to work with the generalized linear models, since these allow us to locate the possible differences of the groups of variables studied with respect to the factors. It is important to mention that the generalized linear models were divided into two parts due to the amount of data that was worked on. The variables that were contrasted with the soft skills factor were: 1) gender,

2) career, 3) failed subjects, 4) ways of learning (visual and auditory), 5) perception of how much a graduate earns, 6) semester, 7) reason for attending school, 8) currently have a job, 9) scholarships, 10) languages, 11) mother's education and 12) father's education (see table 5).

Results

As specified, the Kruskal-Wallis non-parametric test was applied for independent samples. The above to identify the similarity or differences between the scores of factor one and the three educational institutions that were studied. According to the results obtained from the statistical test, the existence of non-similarity between the scores of each school was found ($P > 0.05$) (see Table 2). However, in the average ranges it is observed that the university in Spain is the one that obtains the highest points in the factor that evaluates the soft skills of young people, followed by young people from the IPN and, finally, TecNM students.

Tabla 2. Prueba de Kruskal Wallis, factor habilidades blandas

Escuela	<i>N</i>	Rango promedio
IPN	2118	1819.29
Escuela de Ingeniería de Bilbao	500	1943.71
TecNM	924	1567.04
Ji al cuadrado	55.827	
Grados de libertad	2	
<i>P-value</i>	0.000	

Fuente: Elaboración a partir de los datos obtenidos del software SPSS

Tabla 3. Resultados de las variables independientes

Variables		IPN	Escuela de Ingeniería de Bilbao	TecNM
Género	Masculino	60 %	57 %	61 %
	Femenino	40 %	43 %	39 %
Carreras	Ingeniería en Informática	22 %	-	-
	Ingeniería en Transporte	40 %	-	-
	Ingeniería Industrial	38 %	-	-
	Ingeniería Civil	-	6 %	
	Ingeniería de Minas y Energía	-	7 %	
	Ingeniería Electrónica	-	2 %	
	Ingeniería en Tecnología Industrial	-	62 %	
	Ingeniería en Telecomunicaciones	-	11 %	
	Ingeniería Mecánica	-	4 %	
	Ingeniería en Organización Industrial	-	3 %	
	Ingeniería Eléctrica	-	2 %	
	Ingeniería Ambiental	-	3 %	
	Ingeniería en Tecnologías de la Información y Comunicaciones	-	-	34 %
	Ingeniería en Gestión Empresarial	-	-	22 %
	Ingeniería en Logística	-	-	18 %
Ingeniería Industrial	-	-	17 %	
Ingeniería Ambiental	-	-	5 %	
Ingresos mensuales familiares	De 4000 a 6000 pesos	9 %	-	17 %
	De 6000 a 9000 pesos	41 %	-	45 %
	Más de 10 000 pesos	50 %	-	38 %
	De 4000 a 6000 euros	-	78 %	-
	De 6000 a 9000 euros	-	18 %	-

	Más de 10 000 euros	-	2 %	-
El estudiante cuenta con trabajo	Sí	32 %	11 %	37 %
	No	68 %	89 %	63 %
El estudiante cuenta con beca	Sí	27 %	17 %	27 %
	No	73 %	83 %	73 %
Escolaridad del padre	No tiene estudios	1 %	0 %	2 %
	Primaria	7 %	0 %	7 %
	Secundaria	21 %	13 %	28 %
	Preparatoria	37 %	19 %	33 %
	Licenciatura	28 %	52 %	20 %
	Posgrado	6 %	16 %	10 %
A qué se dedica el padre	Trabaja en una empresa o Gobierno	53 %	59 %	49 %
	Trabaja por su cuenta	50 %	16 %	37 %
	Es desempleado	7 %	25 %	14 %
Escolaridad de la madre	No tiene estudios	1 %	0 %	3 %
	Primaria	9 %	2 %	10 %
	Secundaria	28 %	9 %	31 %
	Preparatoria	38 %	26 %	32 %
	Licenciatura	20 %	45 %	17 %
	Posgrado	4 %	18 %	7 %
A qué se dedica la madre	Trabaja en una empresa o Gobierno	27 %	49 %	23 %
	Trabaja por su cuenta	25 %	15 %	25 %
	Se dedica al hogar	48 %	36 %	46 %

Fuente: Elaboración propia

Results of generalized linear model of the soft skills factor

The generalized linear model allows identifying the variations related to the categories formed by the independent variables. The model was divided into two parts. The first part analyzes the variables of gender, career, failed subjects, learning, how much a graduate earns and the reason for attendance. By means of the bus contrast test, it was found that there are significant variations in the school of the IPN and the TecNM (see table 4). According to the tests of the effects of the model, variation was found in the school of the IPN in the career variables ($P < 0.05$), failed subjects ($P < 0.05$), ways of learning ($P < 0.05$), perception of how much A graduate wins ($P < 0.05$) and the ratio of attendance ($P < 0.05$) (see table 5). Continuing with the analysis of the IPN school, it was

found that the Industrial engineering career is the one that best scored the factor of soft skills; Computer engineering has the lowest score. Regarding the variable of failed subjects, it was found that students who report zero failed subjects are the ones that best qualify the factor: those who said they had more than four subjects without accreditation were the ones that obtained the lowest score. In addition, it was found that the young people who indicated that they learn best when the teacher exposes are those who achieved the best scores in soft skills, while the students who indicated that they learn best when the teacher uses images are those who rated with less scoring skills. In addition to the above, it was found that, as the students progress by semester, their perception of the acquisition of soft skills is positive. Another finding is that the young people who perceived that a graduate earned approximately 10,000 pesos a month were the ones who obtained the most points in soft skills, while those who thought that a graduate earned between 4,000 and 6,000 pesos were those who obtained the least points.

Finally, continuing with the case of the IPN, differences were found regarding the reasons for school attendance: those who best rated the soft skills factor are those young people who indicate that they attend university because they like their degree what are you studying; Those who score with fewer points are those who indicate that they study what their family members have studied.

Now, in the case of TecNM, following the effects of the model in its first part, there were differences in the variables of the degree ($P < 0.05$), the failed subjects ($P < 0.05$), the ways of learning ($P < 0.05$) and the ratio of attendance ($P < 0.05$). In the case of the race, it was found that the one that best evaluates soft skills is Industrial engineering; The one that least qualifies interpersonal skills is Engineering in Information and Communication Technologies. Likewise, it was found that the participants who reported not having failed subjects were the ones who best perceived the acquisition of soft skills. Also that young people who positively rate the elements of soft skills are those that indicate that they learn best when the teacher uses images. Furthermore, students who perceive soft skills are those who indicate that they are studying the careers they like; those who least rate the factor are those who say that they study what in their family they have studied by tradition.

The generalized linear model of the soft skills factor part two was run using the independent variables: 1) work, 2) scholarships, 3) languages, 4) dad's schooling, 5) mom's schooling, 6) dad's job and 7) profession of the mother. In the bus contrast test it was found that the IPN school is the one with the significant difference in the variables

($P < 0.05$) (see table 4). In the effects of the model, it was found that in the IPN the variables with differences are work activity, having a scholarship, mother's language and schooling (see table 5). It should be noted that the young people who indicated that they currently work are what best qualify soft skills. In addition, the participants who indicated having a scholarship are those who perceive the factor in the best way. Regarding the language, it was found that the participants who said they knew the French language rated the interpersonal skills better. Finally, the young people who indicated that their mother has no studies are the ones that obtained more points in the statements.

Tabla 4. Prueba de contraste de ómnibus, factor de habilidades blandas primera parte

Parte del modelo	Escuela	Chi-cuadrado de razón de verosimilitud	<i>P-value</i>
Parte 1. Modelo lineal generalizado	IPN	156.615	0.000
	Escuela de Ingeniería de Bilbao	10.175	0.000
	TecNM	107.327	0.000
Parte 2. Modelo lineal generalizado	IPN	62.163	0.000
	Escuela de Ingeniería de Bilbao	32.623	0.000
	TecNM	36.307	0.000

Fuente: Elaboración propia

Tabla 5. Modelo lineal generalizado de la percepción de las habilidades blandas en las tres universidades

Variables	IPN	Escuela de Ingeniería de Bilbao	TecNM
Género	-	-	-
Carrera	**	-	**
Materias reprobadas	**	-	*
Aprendizaje	**	-	**
Cuánto gana un egresado	**	-	-
Semestre	**	-	-
Razón de la asistencia	**	-	**
Trabajo	*	-	-
Beca	*	-	-
Idioma	*	-	*
Escolaridad del padre	-	-	-
Escolaridad de la madre	*	-	-
Oficio del padre	-	*	-
Oficio de la madre	-	-	-

Nota: * significa que $P < 0.05$ y ** significa que $P < 0.01$ y - indica que no se encontró diferencia ($P > 0.05$).

Fuente: Elaboración propia

As part of the survey, students were asked to mark the five competencies, from a list of 26, which they consider to be of greater importance to an engineer when practicing his profession. Table 6 shows the five most important competencies for each institution.

Tabla 6. Resultados de las cinco competencias que debe tener un ingeniero

IPN	Media	Escuela de Ingeniería de Bilbao	Media	TecNM	Media
Liderazgo	1.42	Resolución de	1.30	Comunicación	1.53
Comunicación	1.52	problemas	1.40	Innovación	1.65
Toma de	1.54	Trabajo en equipo	1.48	Trabajo en equipo	1.66
decisiones	1.57	Toma de decisiones	1.55	Liderazgo	1.68
Innovación		Innovación	1.67	Uso de las TIC	1.68
Resolución de	1.58	Liderazgo			
problemas					

Fuente: Elaboración propia

Discussion

The findings found acknowledge that university students in Spain, unlike Mexican students, are the ones who perceive the soft skills acquired up to the most positively. Young Spaniards are what best qualify communication skills, information processing, they are able to face challenges easily, they have the ability to work as a team, they have initiative and decision to solve problems, they correctly feed back errors, they relate easily, they are persuasive and influential in the decisions that other people make, they carry out self-analyzes and self-criticisms to continue improving, they question ideas of their own and those of those around them, they stay informed on the trends in labor markets , they have the ability to react calmly in situations of adversity and make the most of the electronic means.

For their part, the youth of the IPN, in comparison with the participants of the TecNM and the Spanish students, think that they are capable of showing flexibility when processes of change are presented, they know how to resolve conflicts, they generate new ideas, they feel that they can separate their sphere staff and think that the lessons learned have helped strengthen leadership attitudes.

Shakir (2009) emphasizes that communication skills, critical thinking, problem solving skills, teamwork, lifelong learning, information management, entrepreneurial skills, professional ethics and morals, and ability to lead must be integrated into the curriculum. . Pool (2017) adds that you have to work with the issue of emotional intelligence in soft skills, since a person who is not able to manage their emotions effectively can have very serious consequences in relation to teamwork.

Returning to what was extracted from the analysis of the IPN school, it was found that the Industrial engineering career is the one that best scored the factor of soft skills; On the contrary, Computer Engineering is the one that obtained the lowest score. In addition, young people who indicated that they currently work are those who best rate soft skills. And the participants who said they had a scholarship are the ones who perceive the skills best. Therefore, it agrees with Rao (2014) when he emphasizes that it is feasible to motivate young people to have contact with the industry, since the work environment is a platform that helps work their talents and increase skills soft. Likewise, Musa, Mufti, Latiff and Amin (2012) point out that young people must be able to identify the soft skills that they are acquiring in the classroom and must have the ability to transfer them to the labor field, so that stays in companies. Taylor (2016), finally, recommends that students work on vacations in the industry, as this allows various competencies to be developed.

However, the TecNM was the institution, compared to the other two, whose youth rated the acquisition of socio-emotional competences with lower scores. It was found that the career that best evaluates soft skills is Industrial engineering; The one with the lowest rating was Engineering in Information and Communication Technologies. Likewise, it was found that the participants who reported not having failed subjects were the ones who best perceived the acquisition of soft skills.

Considering the results obtained by the three universities, there is agreement with what Majid et al. (2012), who emphasize the need for young people to raise awareness of the importance of soft skills and the ways in which to develop and practice such. Here it is recommended that universities hold specialized workshops that allow young people to train interpersonal skills. Along the same lines, Direito, Pereira and de Oliveira (2012) note that young people must take responsibility for their professional development and, therefore, must work on deficiencies related to soft skills, since they cannot be depending on the external factors that stimulate the acquisition of these.

In this work, we also agree with Cleary et al. (2017), who propose that higher education institutions work to obtain graduates who meet the requirements of job market vacancies. In addition, it is suggested to implement a positive culture in higher education institutions and, if possible, work as centers of positive psychology. This supports them to increase and improve their socio-emotional skills of students (Devis-Rozental, 2018). Research such as that carried out by Abdullah-Al-Mamun (2012) emphasizes that a professionalizing course can be implemented, lasting three years, that integrates reflective practices, support from a mentor; It is suggested that it integrate topics related to personal

management, personal leadership, coaching, self-awareness, self-motivation, exposition skills, mentoring, teamwork, interpersonal leadership, and ethics.

Young people who have more developed soft skills are those who have more extracurricular activities; One of these could be, for example, supporting some organizations that allow them to work in leadership positions and develop values, since this encourages the development of ethical judgments and that students are healthy in thoughts. It is also recommended to review which are the activities that allow obtaining credits and analyze their relevance. You can also work with outdoor education programs, which allow students to develop communication, leadership, teamwork and problem solving (Lennox and Roos, 2017).

Schools could make efforts to implement training courses related to emotional intelligence, as they have been shown to achieve favorable results in emotional skills. But it is required that young people show a predisposition to learn autonomously and have the ability to use e-learning platforms (Gilar, Pozo y Castejón, 2018).

Regarding the factor that measures the teachers' perception, it was found that the young people of the TecNM are what best qualify the teaching work; secondly, there is the University of the Basque Country, and lastly, the IPN. The generalized linear models made it possible to identify that the participants assigned to the Transport engineering that is taught at the IPN are those who best perceive the elements of the factor; Computer engineering is the career in which young people rate teachers' work with fewer points. Students in Spain who said they have a scholarship and who are working positively rate the work of teachers.

The results found allow us to visualize a complicated scenario that requires work and investment in the area of training by the universities. Teachers are substantial elements in the teaching-learning process, they have the challenge of transmitting technical knowledge, but they also have to work on the socio-emotional skills of the students: too much responsibility for the infinite number of problems they face. You have to work on the well-being of teachers, so it is feasible to consider creating and implementing programs aimed at the emotional intelligence of academics. This could support training academics in ways to avoid stress. (Vesely y Saklofske, 2018; Dewaele, Gkonou y Mercer, 2018)

Conclusions

It is concluded that higher education institutions have to redouble efforts to help young people increase their socio-emotional skills. In accordance with the above and analyzed, it is recommended to study the socio-emotional competencies required by the labor markets of engineers to update the study programs and, in this way, have graduates prepared to enter an environment full of competition. In the case of the IPN, it is necessary to pay attention to the programs related to computer science, since they are the ones that obtained the least points in the subject of soft skills.

It is essential that educational institutions work with young people on social skills that help increase their leadership so that they can aspire to strategic and managerial positions in organizations. However, it must be clear that, to achieve the above, it requires above all attitude, disposition and initiative on the part of the students. Therefore, schools have to reinforce academic stay programs with industry, since students can experience work environments and lose the possible fear of solving problems and living with older and more experienced people. You can also work with workshops that students can take as complementary subjects.

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