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RESEARCH ARTICLE

Professional Preferences and Professional Identity in Engineering Students from a Private University in Arequipa

Preferencias profesionales e identidad profesional en los estudiantes de ingenierías de una universidad privada de Arequipa

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Summary

The present study analyzes the professional preferences in students of four engineering careers from a private university in Arequipa City, in relation to some aspects of professional identity. To that end, we took a sample of 422 students of Industrial Engineering, Electronic and Telecommunications Engineering, Civil Engineering and Computing Science. We applied two instruments: the Pereira's Professional Preferences Profile and the Professional Identity Questionnaire of Arias et al. The results indicate that the engineering students have professional preferences according to its professional field, but a considerable percentage is located in the category of non-defined (24.17%). Moreover, the 18.22% of students of Industrial Engineering have professional preferences for Business Administration, and the majority of them have a professional identity with scientific and technical orientation, regarding object of study, methods and professional goals.

Keywords: Professional Preferences; Professional Identity; Engineering Programs.

Resumen

En el presente estudio se analizan las preferencias profesionales de los estudiantes de cuatro carreras de ingeniería de una universidad privada de Arequipa, en relación con ciertos aspectos de la identidad profesional. Para ello se tomó una muestra de 422 estudiantes de las carreras de Ingeniería Industrial, Ingeniería Electrónica y Telecomunicaciones, Ingeniería Civil y Ciencias de la Computación. Se aplicaron dos instrumentos: el Perfil de Preferencias Profesionales de Pereira y el Cuestionario de Identidad Profesional de Arias et al. Los resultados indican que los estudiantes de ingeniería presentan preferencias profesionales acordes con su campo de estudios, pero con un porcentaje considerable de indecisión (24.17%). Asimismo, el 18.22% de los estudiantes de Ingeniería Industrial presentan preferencias profesionales por la Administración de Empresas, y la mayoría de los estudiantes tiene una identidad profesional con orientación científica y técnica, en cuanto al objeto de estudio, los métodos y los fines de la profesión.

Palabras clave*:* Preferencias profesionales; Identidad profesional; Ingenierías.

Introduction

For many young people, talking about professional preferences is synonymous with a gap in personal knowledge, which is a great limitation when it comes to choosing a profession. Thus, in a local study conducted on adolescents from public high schools, it was reported that a considerable percentage of students do not find meaning in their lives, and therefore, have an existential void (Huamani & Ccori, 2016). This situation has an impact on higher education since young people who have not developed a clear vocation for their profession are unlikely to attain optimal academic achievement or run the risk of becoming mediocre and unmotivated professionals (Arias, 2013).

Although many factors are associated with professional vocation, among the most important factors are personality (Super, 1964), cognitive interests (Schukina, 1968), and professional identity (Hirsch, 2013). The latter, however, has been little studied, and even less in the national context and in engineering students. In this sense, engineering students are expected to have certain skills for the proper performance of their profession, among which we can mention, spatial intelligence (Urrunaga & Esqueche, 2016), problem-solving skills (Acevedo & Linares, 2012b), creativity (García, 2003), entrepreneurship (Tinoco, 2008; Mavila, Tinoco & Campos, 2009), among others.

In this sense, engineering formal education has merited numerous studies including the use of information technology (Huapaya & Lizarralde, 2009; Inche & Chung, 2012; Mayta & León, 2009), teaching styles (Khurshid & Aurangzeb, 2012), and generational student characteristics (Correira & Bozutti, 2017). Thus, Falconí (2005) has pointed out that one of the weaknesses of the quality of the professional education of the Industrial Engineering and Systems Engineering students of the National Engineering University is the lack of academic and administrative management skills. In this regard, Inche, Chung and Salas (2010) indicate that the management of academic-administrative quality lies in its pertinent adjustment to reality and its focus on social capital; highlighting that a key element of knowledge management in the school of engineering is intellectual capital, based on their abilities, knowledge, skills, and degree of commitment and motivation (Inche & Chung, 2004).

Thus, all these elements suggest a coherent development of the vocation with the professional competences, understanding by vocation "a growing tendency toward the profession, based on a vital interest of the subject, either intellectual, ethical, social or others, as well as the awareness of his possibility of satisfying this interest" (Ojer, 1976, p. 143). However, this is a process that, in its broadest sense, starts at home and crystallizes with university education as higher education, in preparing us for the work environment chosen, opens spaces to know, learn, and reflect on the professional career chosen as a source of deployment and development of the professional future (Hernández, 2005).

For López (2003), the vocational and professional choice needs to be seen as a process that is based on the idea of "transformation", aimed at achieving an identity reflected in terms of vocational-occupational roles, based on aspirations, expectations, and preferences. Within Holland's model (1985), professional preferences are developed from personality traits and the work environment where the worker feels satisfied. This model distinguishes six dimensions: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (known as RIASEC by its initials in Spanish, Holland, 1996).

The Realistic corresponds to the typical male who prefers realistic occupations or work situations involving the use of tools and problem-solving, instead of dealing with requests or social situations. The Investigative is introverted and unsociable, and prefers to meditate or reflect on problems instead of being involved in their solutions. The Artistic is expressive, creative, and intuitive, and avoids, like the Investigative, physical effort-demanding problems, but unlike the latter, is more extroverted, and sociable. The Social is responsible, sensitive, humanist, supportive, and cooperative, with great communication skills, and prefers interpersonal situations. The Enterprising also has verbal communication skills, but oriented to business. He has leadership, and intuition, and is strategic in his actions and ideas. The Conventional prefers organized and more traditional activities, such as office work, avoiding social relations and physical effort (Béjar, 1993; Pereira, 1992).

In this way, these professional interests would enable us to approach the essential aspects of vocation (Ojer, 1976). However, given that vocation is a synthesis of the personal history projected toward the future, professional identity is an essential component of professional orientation, but it is also built on a thorough knowledge of the profession. For Harrsch (2011), professional identity includes both the personal history of the individual and the history of the profession, hence knowledge of the history of engineering would be decisive for the identity and vocation of engineering students.

Muller (1997), for his part, although in parallel with professional identity, points out that the two components of vocational orientation are the assumption of personal subjectivity as the construction of one's own identity, and knowledge of social, labor, educational, economic, and historical reality, which favors the understanding of the status of a particular profession at a given time. In that sense, if something characterizes the current society, it is the speed of the technological changes, and the structural transformation of the society that impacts the labor activity and the educational processes that demand permanent orientation throughout life (Echeverría, 2008). Consequently, an appropriate vocational decision needs to accompany the person to reach his professional self-fulfillment, which could even become a protective element of occupational mental health (Arias & Núñez, 2015).

It is therefore important that professional identity be strengthened from school, not only through vocational assessment and counseling techniques that are usually implemented at high school (Rivas, 2003), but rather, through instructional activities consistent with experiences rich in guiding information on the various possibilities of professional deployment and fulfillment in adult life, according to the expectations and skills of students (Martínez-Clares, Pérez-Cusó & Martínez-Juárez, 2014).

In summary, professional identity integrates both professional vocation and the history of the profession, which, in the case of engineering, has a long past of paradigmatic leading figures such as Archimedes, Da Vinci, Galileo, Newton, Edison, Einstein, and so on (Congrains, 1980), as well as the process of institutionalization and formalization of the diverse engineering in which the systematization of purposes, methods, and knowledge lead to the emergence of a historical awareness in which lies the professional identity of the engineer (Arias, 2012).

Likewise, various training activities in the course of undergraduate studies contribute to the development of professional identity, such as pre-professional practices (León & Mayta, 2011), the strengthening of various factors of human and structural capital in universities (Pastrana, 2016), and the systematic assessment of student satisfaction, in order to improve the educational offer in higher education through the feedback inherent to the process (Cadena-Badilla, Mejías, Vega-Robles & Vásquez, 2015). But high-quality standards and academic efficiency on the part of professors and administrative employees involved in university education management (Campos, Quispe, & Calsina, 2011) cannot be ignored, but, above all, it is fundamental to create within the university a work environment of mutual respect and reciprocal collaboration, which is not in favor of personal interests, but rather seeks the common good (Tinoco, Quispe & Beltrán, 2014). In this way, deontological values of great worth for the professional identity of the engineer will be transmitted.

Consequently, this study aims to assess the professional preferences and the professional identity of a sample composed of students of four engineering specialties of a private university in the city of Arequipa in order to analyze their degree of relationship and their manifestations. Therefore, the following question is posed: Is there a relationship between the vocational preferences and the professional identity of students of four engineering specialties of a private university in the city of Arequipa?

Method

Design

This study is non-experimental as the variables were not manipulated for their analysis. Instead, it adopted rather a correlational design with a single sample as the relationship between variables was analyzed (Ato, López & Benavente, 2013).

Sample

We worked with a sample of 422 engineering students of a private university in the city of Arequipa, 255 of whom were men (60.42%), and 167 were women (39.58%). The students pertain to four specialties: 192 study Industrial Engineering (45.49%), 101 study Computer Science (23.93%), 70 study Electronic Engineering and Telecommunications (16.58%), and 59 study Civil Engineering (13.98%). The sample was selected through a stratified probability sampling method, with 95% confidence and 5% margin of error.

Instruments

The professional identity variable was evaluated using the *Professional Identity Questionnaire*, which is an instrument that assesses the professional identity of different professional groups by knowing epistemological aspects of the profession, such as its subject matter of study, its methods, its sources, the professional activities, etc. This test was developed by Arias to assess the professional identity of students and professionals (Arias, Ceballos, Isasa & Tapia, 2015). Its content was validated through the judgment of three academic experts. The test is made up of 4 parts: Profession and professional roles (7 items), Assessment of the profession (4 items), History of the profession (8 items), and Future of the profession (4 items). Of these, only the third category is quantitatively assessed on a Likert scale from 1 to 10. For the purposes of this study, only the data from the first part are reported here.

The professional preferences variable was evaluated using the *Professional Preferences Inventory*. This test was developed by Pereira (1992) on the basis of John Holland's theory (1959), and serves to evaluate the vocational interest of students. The test covers 60 workplaces with their respective descriptions, which can be marked following three criteria: like, dislike, and indifference, in such a way that there are 20 workplaces rated as like, 20 as indifferent, and 20 as dislike. Rates are given according to the answers rated in six dimensions based on Holland's theory (1985) according to the RIASEC model: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. The combination of these rates reflects the interest in different professions. The test has a validity index of 0.70 (item-test correlations), and a reliability index of 0.81 (Cronbach's Alpha test).

Procedure

The corresponding permits were requested from the competent authorities of the university, such as the directors of each professional school; and the students were evaluated in coordination with the professors of certain courses who allowed the students to leave to be evaluated. The test lasted approximately 20 minutes per person, with prior explanation of the purposes of the study and its voluntary acceptance as a participant. The evaluations were carried out individually or in small groups as the case may be.

Results

First, the data were processed descriptively using the analysis of frequencies according to the students' answers and of the central tendency and dispersion statistics. Table 1 shows that of the six dimensions that make up the professional preferences, those that were rated the highest were Investigative (21,379), Realistic (21,180), and Enterprising (20,582). This suggests that the students are interested in manipulating objects and using tools, and in researching and incorporating companies; this corresponds to the IRE combination, which according to Pereira (1992), gives rise to diverse vocational choices such as Textile Engineering, Administrative Engineering, Aeronautical Engineering, Chemical Engineering, Civil Engineering, Electronic Engineering, Physics and Aviation Officer.

Table 1

Descriptive statistics of the professional preferences

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Mean	21.180	21.379	19.414	18.936	20.582	19.172
Median	21	21	19	18	21	19
Mode	23	21	17	17	21	20
Stand. Dev.	3.902	10.236	4.155	8.866	3.164	3.817
Variance	15.226	104.787	17.269	78.611	10.015	14.575
Asymmetry	-0.108	13.138	0.365	16.557	-0.133	0.049
Kurtosis	0.116	198.622	-0.240	315.629	0.804	-0.387
Minimum	10	2	10	2	10	10
Maximum	33	189	33	188	33	30

With respect to the frequencies of the suggested specialties, according to the Professional Preferences Test, the majority of students shows 24.17% indecision as they do not have a defined specialty. Next, 17.29% have professional preferences for Administration, 8.29% for Mechanical Engineering, 6.63% for Systems Engineering to the same extent as those who have preferences for Industrial Engineering, and Agricultural Engineering. Similarly, the students evaluated show a 3.32% preference for both Fisheries Engineering and Accounting (Figure 1).

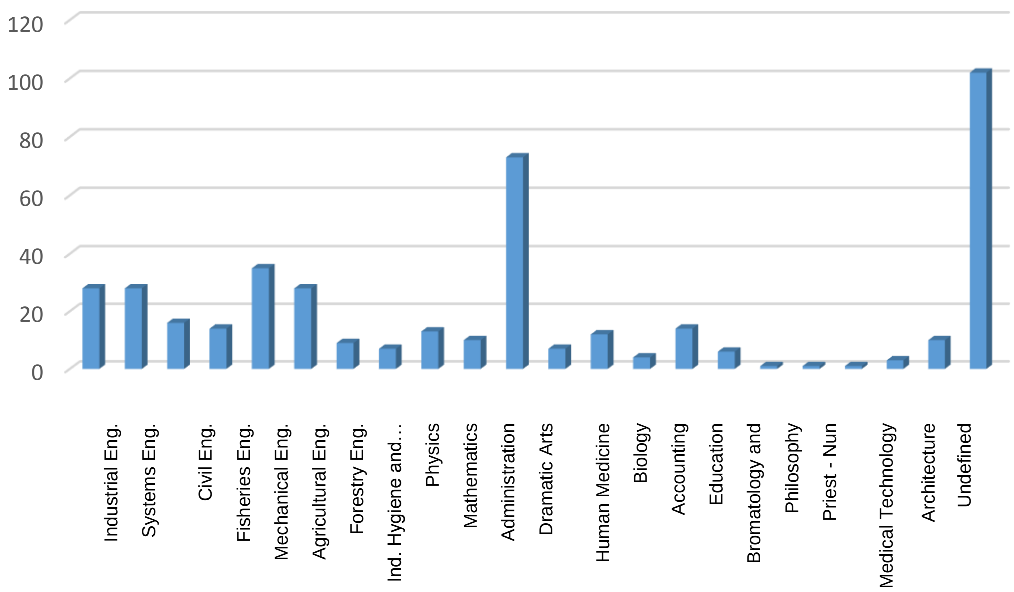

Figure 1. Professional preferences

With respect to the definition of the specialty, 99 students define their specialty as a Profession, 86 as a Science, 27 as an Arts, 22 as a Discipline, 13 as a Technique, and only 3 as a Trade (Figure 2).

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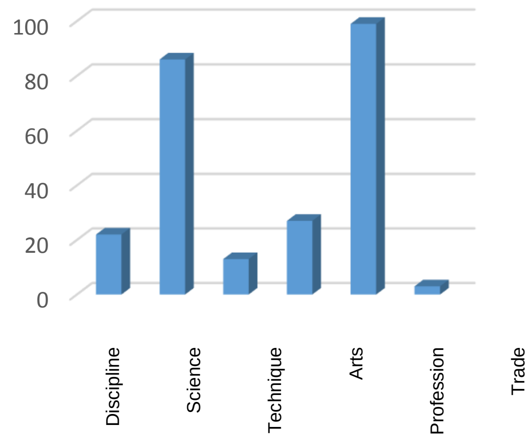

Figure 2. Definition of the specialty

Likewise, 119 students indicate that the most used method in their specialty is Mathematical Method, 87 say Experimentation, 70 indicate Observation, 54 say Statistics, 46 indicate Interpretation, 44 say Cost Analysis, 23 answer Qualitative Method, 15 indicate Bibliographical Method, and 14 answer Survey. The least indicated methods were clinical, genetic, interview, and psychometric (Figure 3).

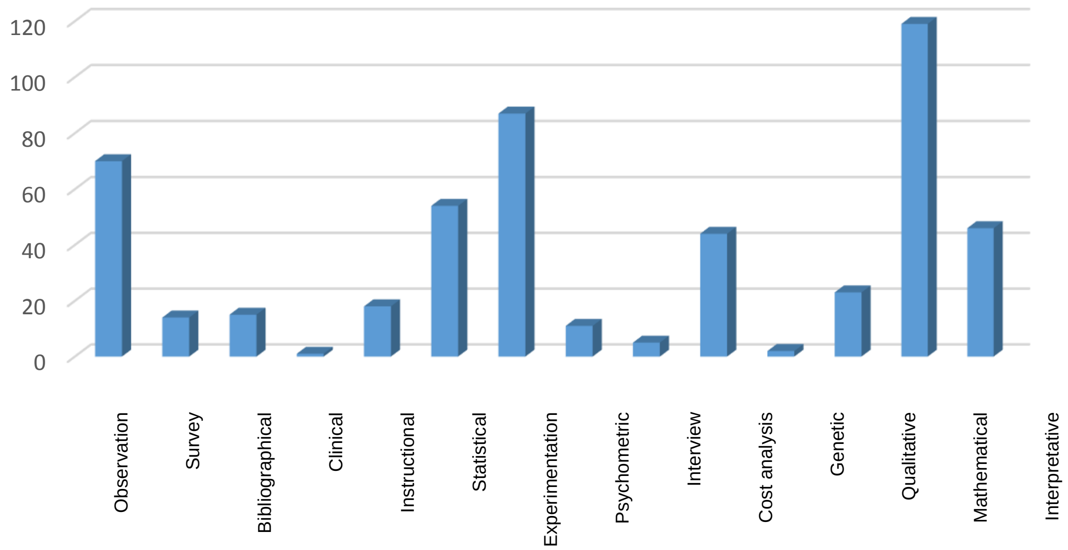

Figure 3. Most used methods in the specialty

When asking about the information sources on which they base, the students indicated to a greater extent that they base on scientific information (159), technical information (105), and experience (53), while literature, news and opinions were the least marked. Legal information is also less frequently answered (12), although higher than these three sources mentioned (Figure 4).

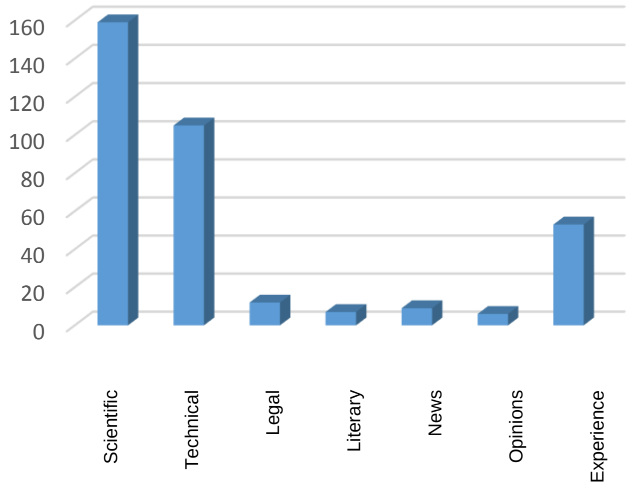

Figure 4. Information sources

When asked about the activities they perform the most in their specialties, they indicated that calculation (93), project development (92), research (88), problem-solving (86), technology design (78), and strategy development (58). The least chosen choices were healing of people, event coordination, and counseling (Figure 5).

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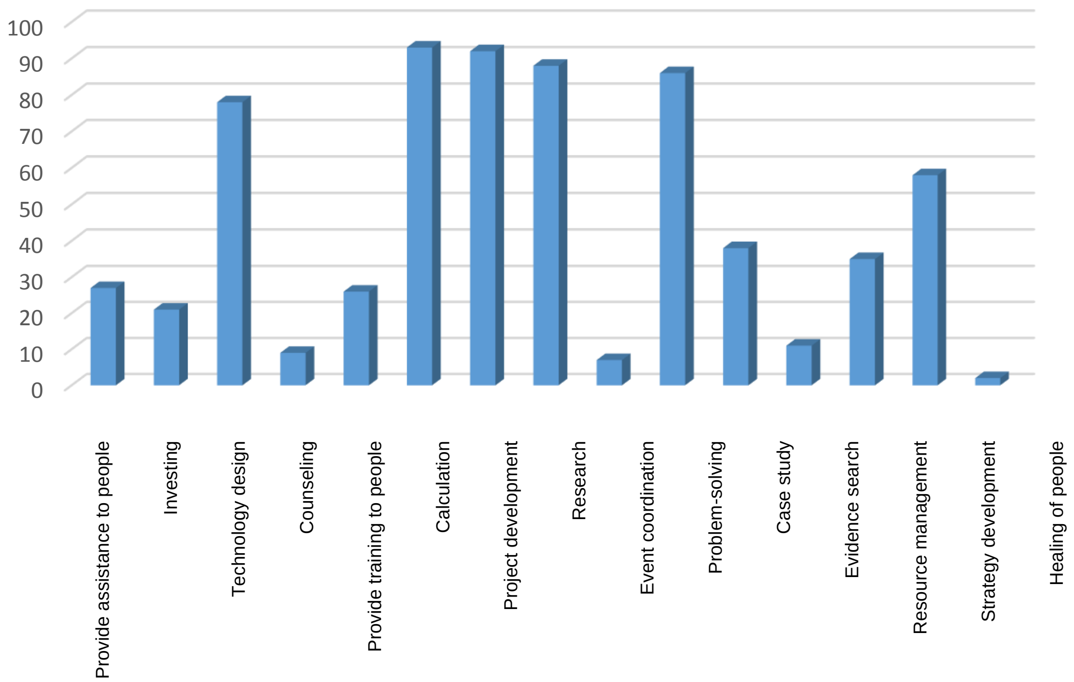

Figure 5. Activities performed

When asked what is the major contribution of your specialty? Or to whom does your specialty contribute the most? They marked Companies (126), People (85), and Society (79). The least chosen alternatives were Children, Family and the State. Science and Environment was the alternative chosen by 34 and 29 students, respectively (Figure 6).

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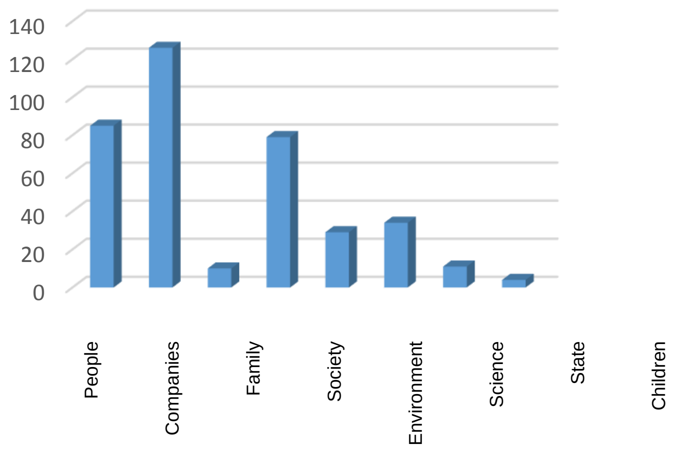

Figure 6. Specialty contributions

When asked to indicate the subject matter of study of their specialty, 92 students marked Technology, 76 Enterprise, 59 Society, 20 People, and 13 Nature. Health, Laws, and Accounts were the least chosen choices (Figure 7).

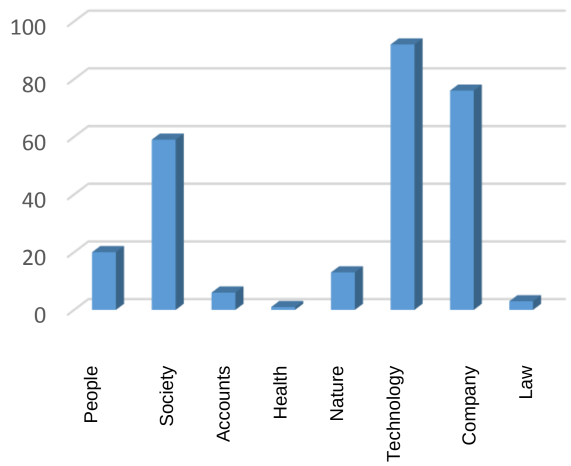

Figure 7. Subject matter of study

When asked to mark the necessary qualities to perform their job duties, the students mostly marked Responsibility, Knowledge, Effort, Precision, Creativity, Communication, Commitment, and Order, while the least chosen choices were Beauty, Health, Solidarity, Sincerity, Tolerance, Authenticity, Empathy, and Kindness (Figure 8).

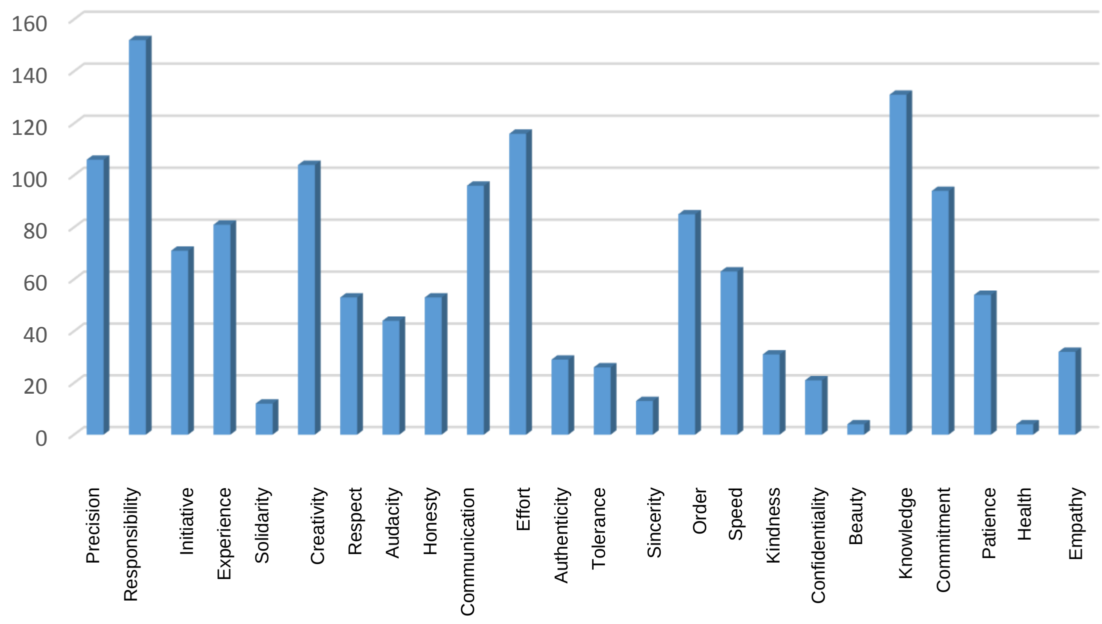

Figure 8. Professional Qualities

In addition to these descriptive assessments, comparisons by student sex were made. Table 2 shows the mean results of the six dimensions of the Professional Preference Profile, as well as the t scores, and the significance level. No significant differences were found.

Table 2.
Comparisons of the professional preferences by sex

	Sex	N	Mean	Stand. Deviation	t	gl	p
Realistic	Male	255	21.250	3.653	0.446	420	0.655
	Female	167	21.071	4.263			
Investigative	Male	255	21.396	11.020	0.043	420	0.965
	Female	167	21.353	8.939			
Artistic	Male	255	19.254	4.133	-0.973	420	0.331
	Female	167	19.658	4.189			
Social	Male	255	18.607	3.219	-0.777	420	0.437
	Female	167	19.437	13.531			
Enterprising	Male	255	20.462	3.278	-0.983	420	0.326
	Female	167	20.766	2.983			
Conventional	Male	255	19.301	3.910	0.868	420	0.385
	Female	167	18.976	3.674			

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The variance analysis was used to compare the professional preferences by student specialty. Only significant differences were found in the Conventional dimension; thus, the mean of the Telecommunications Engineering students in this dimension was 20.257, that of Computer Science was 19.435, that of Civil Engineering was 19.118, and that of Industrial Engineering was 18,656. This means that while Telecommunications and Computer Science students look for a conventional office job, unlike Industrial Engineers and Civil Engineers who look for fieldwork opportunities instead, this being a response pattern typical of the specialty they have chosen.

Table 3.
Variance analysis by specialty

		Sum of squares	gl	Quadratic mean	F	Sig.
Realistic	Inter-groups	93.903	3	31.301	2.071	0.103
	Intra-groups	6316.409	418	15.111		
	Total	6410.312	421			
Investigative	Inter-groups	800.405	3	266.801	2.574	0.053
	Intra-groups	43314.930	418	103.624		
	Total	44115.336	421			
Artistic	Inter-groups	46.422	3	15.474	0.895	0.443
	Intra-groups	7224.006	418	17.282		
	Total	7270.428	421			
Social	Inter-groups	149.778	3	49.926	0.633	0.593
	Intra-groups	32945.493	418	78.816		
	Total	33095.272	421			
Enterprising	Inter-groups	8.018	3	2.672	0.265	0.850
	Intra-groups	4208.579	418	10.068		
	Total	4216.597	421			
Conventional	Inter-groups	140.686	3	46.895	3.269	**0.021**
	Intra-groups	5995.685	418	14.343		
	Total	6136.372	421			

Finally, Table 4 crosses the variables using a contingency table between the chosen specialty and the professional preferences, where it can be seen that 8.33% of the Industrial Engineering students have professional preferences for this specialty, the same as 7.92% of the Computer Science students, and 5.08% of the Civil Engineering students. The 6.25% of the

Industrial Engineering students have a vocation for Systems Engineering (or Computer Science), the same as 6.93% of the Computer Science students.

Likewise, 3.64% of the Industrial Engineering students have a vocation for Civil Engineering, the same as 4.95% of the Computer Science students, 3.38% of the Civil Engineering students, and 2.85% of the Electronic Engineering and Telecommunications students. Two point zero eight percent of the Industrial Engineering students, 4.95% of the Computer Science students, 2.85% of the Electronic Engineering and Telecommunications students, and 5.08% of the Civil Engineering students have professional preferences for Fishing Engineering, while 9.89% of the Industrial Engineering students, 10.16% of the Civil Engineering students, and 6.93% of the Computer Science students prefer Mechanical Engineering. In addition, 8.85% of the Industrial Engineering students have preferences for the Agricultural Engineering specialty, the same as 4.95% of the Computer Science students, and 8.47% of the Civil Engineering students. Three point sixty four percent of the Industrial Engineering students have professional preferences for Forestry Engineering.

Table 4

Crossing variables between the specialty chosen and the professional preferences

		Specialty chosen			
		Industrial Engineering	Computer Science	Telecommunications Engineering	Civil Engineering
Industrial Engineering	F	16	8	1	3
	%	8.333	7.920	1.428	5.084
Systems Engineering	F	12	7	7	2
	%	6.25	6.930	10	3.389
Civil Engineering	F	7	5	2	2
	%	3.645	4.950	2.857	3.389
Fisheries Engineering	F	4	5	2	3
	%	2.083	4.950	2.857	5.084
Mechanical Engineering	F	19	7	3	6
	%	9.895	6.930	4.285	10.169
Agricultural Engineering	F	17	5	1	5
	%	8.854	4.950	1.428	8.474
Forestry Engineering	F	7	1	0	1
	%	3.645	0.990	0	1.694
Industrial Hygiene and Safety Engineering	F	7	0	0	0
	%	3.645	0	0	0
Physics	F	5	3	3	2

	%	2.604	2.970	4.285	3.389
Mathematics	F	4	2	3	1
	%	2.083	1.980	4.285	1.694
Administration	F	35	16	11	11
	%	18.229	15.841	15.714	18.644
Dramatic Arts	F	2	2	3	0
	%	1.041	1.980	4.285	0
Human Medicine	F	5	4	3	0
	%	2.604	3.960	4.285	0
Biology	F	2	1	0	1
	%	1.041	0.990	0	1.694
Accounting	F	6	1	1	6
	%	3.125	0.990	1.428	10.169
Education	F	2	2	0	2
	%	1.041	1.980	0	3.389
Bromatology & Nutrition	F	1	0	0	0
	%	0.520	0	0	0
Philosophy	F	1	0	0	0
	%	0.520	0	0	0
Priest - Nun	F	1	0	0	0
	%	0.520	0	0	0
Medical Technology	F	0	0	3	0
	%	0	0	4.285	0
Architecture	F	4	2	3	1
	%	2.083	1.980	4.285	1.694
Undefined	F	35	30	24	13
	%	18.229	29.702	34.285	22.033
Total	F	192	101	70	59
	%	45.497	23.933	16.587	13.981

x^2= 80.511; gl= 63; p= .038

Finally, 3.64% and 18.22% of Industrial Engineering students have professional preferences for Industrial Hygiene and Safety Engineering, and Administration, respectively; while 15.84% of Computer Science students, 15.71% of Electronic Engineering and Telecommunications students, and 18.64% of Civil Engineering students, have a preference for Administration. Included in the undefined category are 18.22% of Industrial Engineering students, 29.7% of Computer Science students, 34.28% of Electronic Engineering and Telecommunications students, and 22.03% of Civil Engineering students.

Discussion

Super (1963) defines vocational identity as "the possession of a clear and stable path of desires, interests, and talents" (p. 19), and includes traits relevant to the practice of a profession, such as abilities, interests, and values. This vocation is formed from the family, but the school is an essential factor that contributes to its consolidation. Hence, high school completion is a time when adolescents need to make the difficult decision to choose a specialty (Rascovan, 2004), and is linked to the adoption of a life project and the definition of identity (Erikson, 1991).

This process, however, faces a series of obstacles, such as a fantasy image of themselves and the reality, or stereotyped reasoning that is copied from their parents or friends (Muller, 1997), but that regardless of their origin, have an impact on their academic life and their professional performance (López, 2003). We have analyzed in this study the professional preferences and the professional identity of 422 students of four engineering specialties of a private university in the city of Arequipa.

A first finding that is relevant for the purposes of this study is that, although the evaluated students have professional preferences notably for engineering, according to the key obtained (Investigative, Realistic, and Enterprising), there is a wide dispersion of preferences in various specialties within the engineering field that is not consistent with their specialty. A possible explanation of this dispersion is that, as Corominas (2006) says, the changes that have occurred in science and the society in recent decades cause some specialties to be sometimes less distinguishable from each other. In that sense, Damien (2014) points out that hybrid professions are associated with difficulties in the adoption of the professional identity of their pursuers.

Although in the case of engineering, there are clear limits between most of their specialties, we see that the Industrial Engineering, Civil Engineering, Telecommunications Electronics, and Computer Science students have preferences for other engineering such as Mechanical Engineering, Fisheries Engineering, Industrial Hygiene and Safety Engineering, Agricultural Engineering, and Forestry Engineering, so that only 8.33% of the Industrial Engineering students have preferences for this specialty, 6.93% of the Computer Science students have preferences for their Systems Engineering counterpart, and 3.38% of the Civil Engineering students have preferences for this specialty.

On the other hand, a high percentage of engineering students are in the undefined category (24.17%), which means that their professional preferences are not clear yet. This could cause them several problems in their academic performance during their formal education because if they fail to properly define their vocation, they may have difficulties to commit to their specialty (Echeverría, 2008). Likewise, a high percentage of Industrial Engineering students have professional preferences notably for the Administration specialty (18.22%), which could suppose an overlap of both professions.

In that sense, it is often said colloquially and perhaps even pejoratively in our country that industrial engineers are "managers with helmets"; however, both specialties are different, and have different purposes, but their fields of action are similar (Ramírez, 1986). Likewise, historically, administration as a profession came into existence thanks to the work of Taylor (1973) and Fayol (1973) who were industrial engineers. It would be over the years that administration would emerge as a specialized field in business management, while Industrial Engineering is a "branch of engineering that focuses on the design of the production systems and management of material and human resources for the provision of Goods and services" (Acevedo & Linares, 2012a, p. 18).

In that sense, although Industrial Engineering is broader than business administration, it is important that both professionally and epistemologically they maintain their clear limits. Thus, although the engineer can be involved in the management of organizations, in terms of production, safety, and quality processes (Cachay, Acevedo & Linares, 2012), it is the business manager who proposes the marketing and sales strategy, and the organizational design (Marthans, 2002; Hodge, Anthony & Gales, 2003, Daft, 2005). It is important to point out that a previous investigation assessed the professional preferences of students of the last two semesters of the Administration specialty, and reported that approximately 67% did not have a defined vocational profile (Callata, Morales & Arias, 2017), which reinforces the idea of the overlap of these professions.

Furthermore, like Administration, Industrial and Safety Hygiene Engineering emerged as an independent field of Industrial Engineering in 1918 (Arias, 2012), but was part of the subject matter of study of Industrial Engineering. Precisely, 3.64% of the Administration students have professional preferences for Industrial Hygiene and Safety Engineering. Today, however, the occupational safety training delivered to industrial engineers is usually very superficial, and requires greater emphasis within the current legal framework (Mancera-Ruíz, 2017).

An interesting fact is that no differences have been found in the professional preferences according to the sex of the engineering students, while other previous studies, also conducted in Arequipa, on Education and Administration students, have reported that men and women rated higher in the Realistic and the Social dimensions, respectively (Arias et al., 2015; Callata et al., 2017), as predicted by Holland's theory. In this study, only significant differences were observed in the Conventional dimension when the specialty of the participants was taken as a criterion for comparison. Thus, the Industrial Engineering and Computer Science students prefer more specialties typified as conventional, which are less physically-and socially-demanding, and have traditional job roles.

In terms of professional identity, mediated by the epistemological conception of the students, the majority (185 students or 43.8% of the sample) tend to consider their specialty as a profession and a science. Likewise, the methods and techniques most used by the engineering students were mathematics, experimentation, observation, and statistics, while the most consulted information sources were scientific-technical in nature, and the subject matter of study of their professions were preferably technology, business, and society. These answers as a whole involve a vision framed in science and technology, with a clear orientation toward the company. In other words, these answers are characterizing their professional preferences such as Realistic, Investigative, and Enterprising.

In that sense, it can be said that engineering students have a realistic vision of their profession; therefore, their professional identity is consistent with the epistemological criteria of the profession. In terms of research, other national studies have shown that engineering students have more favorable attitudes toward scientific research than their peers of social sciences specialties, and that the best predictor of these rates is their attitudes toward the research professors (De la Cruz, 2013). This implies, on the one hand, that engineers have a greater predisposition to and better training in research, which is consistent with the fact that, at least in Peru, the largest number of researchers registered with the National Council for Science, Technology and Technological Innovation (CONCYTEC) pertain to the different specialties of engineering and hard sciences. On the other hand, the professor would play an essential role in the transmission of values and knowledge oriented to research, which would not only favor the interest in science but could also have a favorable effect on their academic performance. The study of Rosario, Chamorro and Moreno (2016) reported, for example, that the students who highly valued scientific work had a higher academic performance than their peers who did not have positive attitudes toward research.

Regarding entrepreneurship, which is another characteristic preference of the engineering students who have been evaluated in this study, other research works have reported that there are multiple factors that favor entrepreneurial skills such as the origin school (Tinoco, 2008), creativity, sociability, and planning (Mavila, Tinoco and Campos, 2009), but regardless of these explanatory factors, according to some reports on engineering students of two public universities in Lima, the engineering students have high entrepreneurial skills (Loli, Aliaga, Del Carpio, Vergara & Aliaga, 2011; Loli, Dextre, Del Carpio & La Jara, 2010), which is consistent with our results.

Finally, we can conclude that the engineering students of this private university in Arequipa have a vocational profile oriented toward engineering, but with a wide dispersion of professional interests within this same field. There is also an overlap of the professional preferences of Industrial Engineering students with the Business Administration specialty, but in general, they have a scientific view of their profession in most cases. Consequently, we consider that this study will contribute to have better know the professional preferences of the engineering students, and that it could have an impact on the structure of the curriculum, their pre-professional practices, and its scientific and deontological contents, and may serve as a precedent for future research in other engineering schools of the country's universities.

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