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Sample Design of the Interview about Gender Equality

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1. SAMPLE'S OBJECTIVE

To determine the size of the students and academics population sample related to gender equality in the institutes and branches.

2. TARGET POPULATION

The study is oriented to the student's population with a higher level and full time and per academic hours in the following institutes and branches:

Students And Teachers

- Apan's branch
  - *Economic and financial Engineering BA
  - *Biosciences Engineering BA.
  - *Nanotechnology Engineering BA.
  - *Cold technology Engineering BA.
- Tizayuca's branch
  - *Technological management BA
  - *Industrial Automation Engineering BA.
  - *Computer Engineering BA
  - *Automation Technology Engineering BA
  - *Information Technology BA
  - *Tourism BA.

Basic Sciences and Engineering Institute

*Academic Area of Biology	-Biology BA.
*Academic Area of Earth Sciences and Materials	-Materials Engineering BA. -Materials Sciences Engineering BA. -Environmental Geology Engineering BA. - Metallurgical Miner Engineering BA
*Computer and Electronic Academic Area	- Computer Sciences BA. -Engineering and electronics BA. -Telecommunications Engineering BA.
*Engineering and Architecture Academic Area	- Architecture BA. - Civil Engineering BA. - Industrial
*Mathematics and Physics Academic Area	-Physics and Advanced Technology BA. -Applied Mathematics BA.
*Chemistry Academic Area	- Food chemicals BA - Chemistry BA.

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SOCIAL SCIENCES AND HUMANITIES	*Educative Sciences Academic Area	-Educative Sciences BA.
	*Politic Sciences and Public Management Academic Area	-Politic Science and Public Management BA.
	*Law and Jurisprudence	-Law BA
	*History and Anthropology Academic Area	- Social Anthropology BA. - Mexican History BA.
	*Sociology and Demography Academic Area	-Regional Planning and Development BA. - Sociology BA.
	*Social Working Academic Area	- Social Working BA.
	*Communication BA.	- Communication BA.
	*Foreign Language Academic Area	- Foreign Language BA.

3. SAMPLE RANGE

The sample is designed in order to give results about equality, an also about the gender violence and discrimination inside the Institutes and Branches in Universidad Autónoma del Estado de Hidalgo.

4. SAMPLE DESIGN

The sample design of this study is characterized by its probabilistic, so, the interview obtained results are generalized to the entire sample and are by order, because the last selected unit are the students and teachers that are enrolled in some BA.

In the stratified sample, the population of N units is divided in subpopulations of N1, N2, N3…..NL units, respectively. These subpopulations are not overlapped and in their groups include all the population, so, (Cochran, 1977):

$$N_1 + N_2 + N_3 + \cdots + N_L = N$$

The subpopulations are called stratum, to get all the benefits of this stratification, the values of the Nb must be known. Once determined the stratums, a sample of each one is removed, the removals must be done independently in the different stratums. The sizes of samples in the stratums are denoted as $n_1, n_2, n_3, \dots, n_L$

5. SAMPLE SETTING

The setting of the sample used related to a stratified sample, which is classified in the following way:

Stratum 1	Stratum 2	Stratum 3	Stratum 4
155 Economical and Financial Engineering BA. (2015) 107 Biosciences Engineering BA. (2015) 87 Nanotechnology Engineering BA (2015) 120 Cold Technology Engineering BA- (2012) 121 Technological Paperwork BA. (2009) 52 Industrial Automation Engineering BA. (2017) 136 Computer Engineering BA. (2010) 82Automation Technologies Engineering BA. (2010) 71 Information Technologies BA. (2017) 375 Turism BA. (2001) 587 Biology BA. (2004) 215 Materials Engineering (2013) 9 Materials Science Engineering BA. (Manufacturing) (2003) 4 Materials Science Engineering BA. (Nonmetallic materials) (2003) 384 Environmental Geology Engineering BA. (2004 -2016) 100Environmental Geology Engineering BA. (Plan 2004 Aplied Geology Engineering) (2004)			

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499 Metallurgical Miner Engineering BA. (2010) 776 Computer Sciences BA. (2010) 403 Electronics Engineering BA. (2010) 511 Telecomunications Engineering BA. (2012) 937 Architecture BA (2003) 923 Civil Engineering BA. (2010) 894 Industrial Engineering BA. (2010) 162 Physics and Advanced Technology BA. (2004) 203 Applied Maths BA. (2010) 14 Chemical Food BA. (2000) 341 Chemistry (2000) 363 Chemical Food BA. (2013) 504 Education Sciences BA. (2000) 552 Politic Sciences & Public Management BA. (2013) 34 Politic Sciences & Public Management BA. (2005) 801Law BA. (2005) 58 Social Anthropology BA (2009) 121 Mexican History BA. (2013) 143 Regional Planning and development BA. (2013) 108 Sociology BA. (2003) 23 Sociology BA. (Culture Sociology) (2003) 432 Social working BA. (2013) 695 Communication BA. 249 Foreign Language BA.	Apan's Higher education School Tizayuca's Higher education school Basic Sciences & engineering' Institute Social Sciences & Humanities' institute	Students 10582 Teachers 1769	12351

Chart 1. Population Stratum

Source. Personal making

6. ELEMENTAL UNITS FORMATION OF SAMPLE

The elemental units of sample are grouped in four events, related to the population that is formed by Institutes and Branches , so that, the sample remain in the following way:

-1st period: based in the last part, it is calculated the size of the sample, it must be representative of the target population in each BA. If we start of the case that the electoral cage is a simple random process, the size of the sample is determined through the following algebraic expression:

$$n_j = \frac{N_i * (Z_\propto)^2 PQ}{e^2(N_i - 1) + (Z_\propto)^2 PQ}$$

Where:

- Ni is the size of the sample j –BA
- Ni is the size of the population j-BA
- P is the amount of success response
- Q is the amount in failure response
- $Z_\propto$ with a trust level of 0.95, its value will be 1.96
- E is the highest mistake allowed that we are ready to make to M for a trust level of 95%. For this case, the highest failure allowed is 16%

- 2nd Period: once calculated the sample in each BA., we make the calculus of the sample size of each Institute and Branches, this calculus must be in the following way:

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$$\sum_{j=1}^{n_j} n_j = n_i \text{ ; such that } i \neq j \text{ where i and j go from } 1,2,3, \ldots, L$$

-3rd period: from second period on, it is calculated the sample size of students and teachers, it means:

$$n_D = \sum_{i=1}^{n_i} n_{Di} \rightarrow \text{sample Size for teachers}$$

Where:

$$n_{Hi} = n_i\left(\frac{N_D}{N}\right), \text{where } N_D \text{ is the teachers population and N is the full population}$$

$$n_A = \sum_{i=1}^{n_i} n_{Ai} \rightarrow \text{is the students sample}$$

Where:

$$n_{Ai} = n_i\left(\frac{N_A}{N}\right), \text{where } N_A \text{ is the students population and N is the full population}$$

Based in the last part, the sample size is stated in the following way:

Teacher	Student	STRATUM I		STRATUM II	STRATUM III	STRATUM IV
4	26	30	Economical and Financial Engineering BA. (2015)			
4	24	28	Biosciences Engineering BA. (2015)			
			Nanotechnology Engineering BA			
4	23	26	(2015)			
			Cold Technology Engineering BA-			
4	25	29	(2012)			
			Technological Paperwork BA.			
4	25	29	(2009)			
			Industrial Automation Engineering			
3	19	22	BA. (2017)			
			Computer Engineering BA. (2010)			
4	25	30	Automation Technologies			
		26	Engineering BA. (2010)			
3	22	25	Information Technologies BA. (2017)			
5	21	34	Turism BA. (2001)			
			Biology BA. (2004)			
5	29	35	Materials Engineering (2013)			
4	30	32	Materials Science Engineering BA.			
1	28	7	(Manufacturing) (2003)	Apan's Higher education	114	Students
1	6	4	Materials Science Engineering BA.	School		114
			(Nonmetallic materials) (2003)	Tizayuca's Higher education	165	
5	3	34	Environmental Geology Engineering	school		Students
			BA. (2004 -2016)	Basic Sciences &	529	
			Environmental Geology Engineering	engineering' Institute		Teachers

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4	29	27	BA. (Plan 2004 Aplied Geology	Social Sciences &	351	162
			Engineering) (2004)	Humanities' institute		
5	24	35	Metallurgical Miner Engineering			Teachers
			BA. (2010)			
			Computer Sciences BA. (2010)			
			403 Electronics Engineering BA.			
5	30	36	(2010)			
			Telecomunications Engineering BA.			
5	31	34	(2012)			
5	30	35	Architecture BA (2003)			
			Civil Engineering BA. (2010)			
5	30	36	Industrial Engineering BA. (2010)			
			Physics and Advanced Technology			
5	31	36	BA. (2004)			
5	31	36	Applied Maths BA. (2010)			
4	31	31	Chemical Food BA. (2000)			
4	26	32	Chemistry (2000)			
			Chemical Food BA. (2013)			
1	27	10	Education Sciences BA. (2000)			
5	9	34	Politic Sciences & Public			
5	29	34	Management BA. (2013)			
5	29	35	Politic Sciences & Public			
5	30	35	Management BA. (2005)			
3	30	18	Law BA. (2005)			
			Social Anthropology BA (2009)			
5	16	36	Mexican History BA. (2013)			
			Regional Planning and development			
3	31	23	BA. (2013)			
4	20	29	Sociology BA. (2003)			
4	25	30	Sociology BA. (Culture Sociology)			
4	26	28	(2003)			
			Social working BA. (2013)			
2	24	14	Communication BA.			
5	12	35	Foreign Language BA.			
5	30	36				
5	31	33				
	28					

Chart 2. Sample strata
Source. Personal making

7. Spread factors

The spread factor over P sample units of that random selection is made by the following expression:

$$fexp_{I\,(i)} = \frac{N_{(i)}}{n_{(i)}} \text{ for } i = 1,2,3$$

Where

*$N_{I(i)}$: students and teachers quantity

*$n_{I(i)}$: selected students and teachers quantity

Applying the previous part:

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From the context in Institutes and Branches:

INSTITUTES AND BRANCHES	POPULATION	SAMPLE	SPREAD FACTORS
Apan's higher education Branch	469	114	4
Tizayuca's higher education Branch	837	165	5
Basic sciences & engineering Institute	7325	529	14
Social sciences & humanities Institute	3720	351	11

Chart 2. Sample stratums

Source. Personal making

The ability that each student and teacher has from the total population is the following:

*In the Apan's higher education school each selected student and teacher in the sample has the ability to represent to 4 of them.

*In Tizayuca's higher educationschool each selected student and teacher in the sample has the ability to represent to 5 of them.

*In the Basic Sciences and Engineering Institute, each selected student and teacher in the sample has the ability to represent 14 of them.

* In the Social Sciences and Humanities Institute, each selected student and teacher in the sample has the ability to represent to 11 of them.

From the context of students and teachers:

	POPULATION	SAMPLE	SPREAD FACTOR
Students	10582	998	11
Teachers	1769	162	11

The ability that each selected student and teacher has in the total population is 11 persons, it means, each selected student and teacher has the ability.

8. SAMPLE VIABILITY

To determine the sample's viability is very important that it is verified the sample's adjustment. Based in that part, we use the following algebraic expressions:

- Calculating the estimator the average show :

$$\bar{y}_{st} = \sum_{h=1}^{4} W_h \bar{x}_h = \left(\frac{114}{1160}\right)(28.38) + \left(\frac{165}{1160}\right)(27.56) + \left(\frac{529}{1160}\right)(29.41) + \left(\frac{351}{1160}\right)(29.28)$$

So that:

$$\mathrm{V}(\bar{x}) = \sum_{h}^{L} W_h^2 (1 - f_h) \frac{S_h^2}{n_h} = \left(\frac{114}{1160}\right)^2 \left(1 - \frac{114}{469}\right)\left(\frac{2.68}{114}\right) + \left(\frac{165}{1160}\right)^2 \left(1 - \frac{165}{837}\right)\left(\frac{18.07}{165}\right) + \left(\frac{529}{1160}\right)^2 \left(1 - \frac{529}{7325}\right)\left(\frac{1384}{529}\right) + \left(\frac{351}{1160}\right)^2 \left(1 - \frac{351}{3729}\right)\left(\frac{198.28}{351}\right)$$

Such that:

$$\mathrm{V}(\bar{x}) = 0.00017 + 0.0017 + 0.505 + 0.047 = 0.554$$

*The standard deviation of the amount:

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$$Sd(\bar{x}) = \sqrt{V(\bar{x})} = \sqrt{0.553} = 0.744$$

*The relative mistake of the sample

$$Cv(\bar{x}) = \frac{Sd(X_{st})}{X_{st}} = \frac{0.744}{28.99} = 0.026$$

*The relative accuracy of the sample:

$$Pr = [1 - Cv(\bar{x})] * 100 = [1 - 0.026] * 100 = 97.4\%$$

Such precision is classified in the following way:

- $Pr \geq 95\%$ ⇒a very good sample
- $90\% \leq Pr < 95\%$ ⇒good sample
- $80\% \leq Pr < 90\%$ ⇒suitable sample
- $Pr < 80\%$ ⇒don't suitable

With a level of confidence of 0.95, with a level of significance of 0.05 and with a relative mistake of 2.6%, they can be sampled 1160 people, it reach a representation of 97.4% over the focus population.

*Confidence interval to each stratum of the square:

$$\left[\bar{x} \pm \left(Z_{\frac{\alpha}{2}}\right)\sqrt{V(\bar{x})}\right]$$

So that,

$$[28.98 \pm (1.96)\sqrt{0.553}] = [27.52 ; \; 30.44]$$

In total terms:

$$[1100.8 ; \; 1217.6]$$

With a level of confidence of 0.95 and a significance level of 0.05 the size of the sample can vary in 1101 to 1218 surveys.

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