

## Aphorisms and Short Phrases as Pieces of Knowledge in the Pedagogical Framework of the Andalusian School of Public Health

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### ABSTRACT

**Background:** Bearing in mind the philosophical pedagogical significance of short phrases for the training of researchers in the health care ambit, we hence have studied the aphorisms and striking phrases expressed during the epidemiology course at the Andalusian School of Public Health.

**Methods:** Belonging to the qualitative type and applied through the establishment of a multidisciplinary focus group made up of ten post-graduated students, where one of them acted as a moderator. The collection of information lasted four months. Information was classified in two ways: Firstly, aphorisms and short phrases with a pedagogical impact; and secondly, data with statistical, epidemiological, epistemological, pragmatic, or heuristic component, and for scientific diffusion. It was decided to perform a triangulation that included a descriptive presentation and a basic categorical analysis. The two teachers with a highest interpretative load have been identified .

**Results:** A total of 127 elements, regarded as of interest by the focus group, were collected. Forty-four of them (34.6%) were aphorisms, and 83 were short phrases with a pedagogical load (65.3%). Most of all them were classified as statistical elements (35.4%) followed by epistemological (21.3%) and epidemiological (15.7%) elements. There was no tendency towards aphorisms or short phrases ( $P > 0.05$ ) among the teachers with more informative representation.

**Conclusion:** There has been a tilt in the contents towards the statistical area to the detriment of the epidemiological one. Concept maps have visualized classifications. This sort of qualitative analysis helps the researcher review contents acquired during his/her training process.

**Keywords:** Aphorisms, epidemiology, expert testimony, focus group, knowledge, metaphor, qualitative research

*“Health is not only to be well but to be able to use well every power we have”*

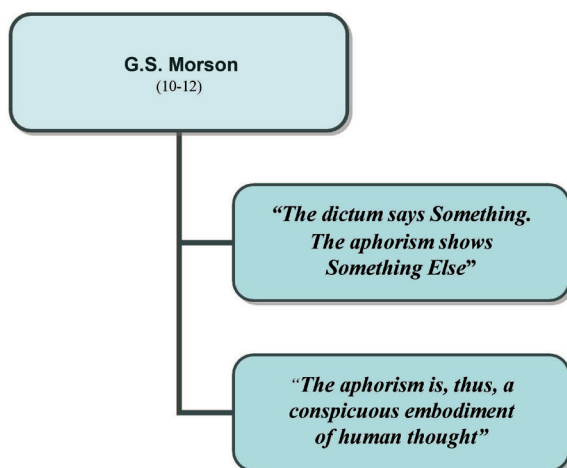
*Florence Nightingale (1820–1910)*

## INTRODUCTION

The term aphorism comes from the Latin word *aphorismus*, and this last from the Greek ἀφορισμός (Aphorismós). In turn, it also comes from the term *aphorizein* (define, separate), which is formed by *apo* (out of, away) and *horos* (boundary, limit). It differs from apothegm (from the Greek term *apophthegma* to the Latin) in that this last term is a brief and amusing phrase with a moral and instructive content. At first, an aphorism referred to the medical rules written by Hippocrates (460 BC to 370 BC).<sup>[1]</sup> In English, these rules are known as “pearls of knowledge”.<sup>[2-8]</sup> The Encyclopedia Britannica defines the term as a concise expression of doctrine or principle of any generally accepted truth conveyed in a pithy, memorable statement.<sup>[9]</sup>

To us, G. S. Morson's essays<sup>[10-12]</sup> [Figure 1] represent the basic theoretical framework for developing this article. His writings are crucial for defining an aphorism as a sort of short prose piece. They should be differentiated from quotations,<sup>[13]</sup> riddles,<sup>[14,15]</sup> short phrases (dicta),<sup>[11,12]</sup> maxims,<sup>[16-20]</sup> proverbs,<sup>[21]</sup> slogans,<sup>[22,23]</sup> witticisms,<sup>[12]</sup> and epigrams.<sup>[21]</sup> It is also advisable to differentiate them from adages,<sup>[10-12]</sup> rule of thumb,<sup>[10-12]</sup> and anecdotes.<sup>[24]</sup> Morson's thesis advocates for distinguishing between aphorism<sup>[10-12,21,25-29]</sup> and the positive-natured short phrase (dictum – dicta),<sup>[10-12]</sup> while it states that the first is, in a way, the opposite of the second [Figure 1].<sup>[10-12]</sup>

On the other hand, Miquel Porta has expressed that aphorisms are to the thought as to what music scores are to music: that is, an invitation,



**Figure 1:** Two fundamental statements pronounced by G. S. Morson

a pathway.<sup>[30]</sup> As to the health care area, the concept aphorism is used to create evidences.<sup>[31]</sup>

As to other issues, a concept map is a teaching strategy within the constructivism theory that results in significant learning processes by relating concepts. It is characterized by its simplification, hierarchization, and visual impact.<sup>[32-36]</sup> Despite all these publications, we have not found any original survey that had studied the contents of a methodology course through the use of aphorisms and short phrases.

We bear in mind the epistemological significance of these concepts and the potential utility that they have in a researcher's career; our main objective in this work included compiling and classifying the highest number of aphorisms and short phrases during the course called Andalusian School of Public Health (ASPH) 's Epidemiology and Clinical Research. Our secondary goals comprised the following: (1) to analyze its temporal distribution during the course; (2) to identify teachers with more collected information; and (3) to carry out a concept map that may include the most suggestive concepts of each type by following the guidelines of constructivism learning.

## METHODS

At the end of the ASPH's Epidemiology and Clinical Research Diploma, 14<sup>th</sup> edition, we intended to compile the most interesting aphorisms and short pedagogical phrases expressed by the teacher during 300 presential teaching hours of the aforementioned course, as well as two review sessions and the material provided by the intranet (virtual campus). The length of the course is around 1 year, with 1-week-in-a-month period of presential teaching and a holiday break in August. Our edition lasted from April 2009 until April 2010. In order to academically pass the Epidemiology Expert exam, it is necessary to submit a personalized research project. This article does not explicitly analyze that part of the teaching content.

### Hypothesis

Once we accepted the null hypothesis that our course is an acceptable proof of the teaching work of the Andalusian Public Health School, our work hypothesis was to highlight the educational significance of aphorisms and short phrases.

### Focus group

The technique used for the study was qualitative, which required the constitution and development of a focus group and the exchange of information via e-mail during the 4 months that followed after the conclusion of classes and the final exam. The informant had to state with clarity the aphorism text, or short phrase, the teacher, and the moment it had been referred. The process of collecting material lasted 4 months (April–July 2010). Fourteen students out of a group of 25 were asked to collaborate by following a criterion of personal knowledge and psychological structure (universe = 25; sample = 14). The number of answers was 10. Therefore, the focus group was eventually made up by 10 students of the course.

The different medical specialties included: two pharmacists in the pre-doctoral phase, who were involved in active research projects both in primary health care services and in hospital; a nurse carrying out teaching functions on bioethics of research; a physical therapist engaged in teaching and research functions; an intensivist in pre-doctoral training; a family doctor carrying out teaching and research functions at a center; a biologist in basic research engaged in impact research; an in-hospital neurologist in pre-doctoral training; an in-hospital pediatrician in charge of the management of a welfare service and in the teaching of post-graduated students; and a family doctor carrying out and managing research works in primary health care.

There was no leadership in the group, although one of the members acted as moderator.

Once all the information was collected, we decided to draft a classificatory list that could meet the highest reasonable criteria. The elimination process was almost zero, as it represented a low percentage (less than 5%) of the information provided by the researchers who decided to form the focus group. Repetition of elements was generally the cause of elimination. The first classification focused on Morson's articles [Figure 1]<sup>[10-12]</sup>, which constituted the base of our concept scheme: The information with a higher positive content was included within the group of highly pedagogical phrases (*dicta*),<sup>[11,12]</sup> while those with a distinctive epistemological and philosophical value were classified as aphorisms.<sup>[11,12]</sup> At the same time, we

classified aphorisms and short sentences (“*dicta*”) into five subtypes: (a) statistical, (b) epidemiological, (c) epistemological, (d) for scientific diffusion, and (e) pragmatic or heuristic.

A classification comprising scientific concepts must include a series of special features, as for instance, to be a partition in the mathematical sense, and, at the same time, those elements included in the group must have an equivalence relation.<sup>[37]</sup> In general, a classification is regarded as more natural than another when the concepts comprising the first one are, from the pedagogical point of view, more productive. Although we took into account these principles, it is worth mentioning that the object to be classified was not essentially scientific but, basically, epistemological and pedagogical.<sup>[37]</sup> Any formal coincidence that may have occurred between epistemological aphorisms and short epistemological phrases was resolved by discussing it within the group. Classifications functioned as qualitative categories. Temporal distribution and the drafting of concept maps were developed as secondary goals.

### Preliminary triangulation

Quantitative results, described in this paper, are the result of simultaneous triangulation.<sup>[38-40]</sup> A Chi-square test was used to prove the dependence hypothesis between the two most mentioned teachers and their pedagogical elements. The descriptive statistical study was carried out through the R program, version 2.9.2.<sup>[41]</sup>

### Ethic permission

All members in charge of both the course and the educational institution knew, at all times, the origin and the development process of this work and gave their consent to it.

## RESULTS

The compiled information is described and classified as follows:

### A) Statistical aphorisms

1. Statistics analyzes variability
2. What is special about statistics is its capability to quantify uncertainty
3. Statistics proves association instead of causality

4. Descriptive statistics is not the poor sister of research
5. Let us assess between what is observed and what is expected!
6. Our world, our life, our destiny are dominated by uncertainty; this is perhaps the only statement we may assert without uncertainty – Bruno de Finetti
7. The concept of representativity is intuitive and cannot be defined. Then, a sample can be representative when it has the same variability than the population
8. Random can be defined as something that cannot be programmed
9. Astolineal regression, what  $R^2$  (determination coefficient) says goes

#### B) Statistical short phrases

10. The central limit theorem turns what is normal into non-normal
11. As to sociological subjects, determination coefficients ( $R^2$ ) tend to be low since variables used are scarcely informative
12. Transformation of data into a square root and logarithmic transformation are the processes that most linearize a distribution
13. A mathematical mean can also be known as mathematical hope (E)
14. There are terminological differences between multivariate linear regression (where all predictors are continuous) and the analysis on the covariance (where some predictor, or predictors, is a factor)
15. In order to make  $\beta_0$  have sense in a multivariate linear regression, all variable predictors must have zero as a possible value. Otherwise, it is necessary to center the predictor
16. Astomultivariatelinearregression, coefficients of a variable in a model are determined by measurement units. Significance does not depend on measurement units
17. In logistic regression,  $\beta_0$  can only be interpreted in cohort studies
18. The model of logistic regression fails to explain the deviance, or remoteness. It is equal to the sum of squares of residuals in linear regression. The more remoteness, the higher the maladjustment
19. Residual deviance is the degree of unawareness after executing the control through one or various predictors
20. Sample estimators are random variables, while population means are regarded as parameters
21. A sample is a methodological intermediary that is used to give an answer to our question
22. The sample size does not always solve representativity
23. The fallacy of transposed conditionals
24. Confidence intervals in the Bayesian background are probability intervals, while the parameter is situated somewhere amid the extremes. Confidence intervals within the frequentist environment are not probability intervals
25. The most homogenous the variables, the highest is the design effect
26. A null hypothesis is always an equality hypothesis
27. Expected frequencies are those that should have occurred if the null hypothesis ( $H_0$ ) was true
28. Odds ratio (OR) distribution is abnormal
29. The distribution of the natural logarithm of odds ratio is normal ( $\ln OR$ )
30. A parameter is a population statistical value
31. Estimates on parameters may be point estimates or may be attained through confidence intervals
32. The origin of the sampling error is due to the use of probabilistic sampling
33. The sampling error is assumed by the process of analyzing the sample instead of the complete population
34. The probability distribution curve concerning the normal sample is characterized by the following: (a) when mean, median, and mode coincide; (b) when it is asymptotic, that is, it goes parallel with the abscissas axis toward infinity; (c) when it is two-tailed
35. The central limit theorem is the statistical foundation of confidence intervals
36. Multilevel or hierarchical regression can differentiate one group of variables from the other and is mostly used in Pedagogy than in Health Science
37. In a linear model, differences among



variables are constant; but when there are non-constant differences, it is said that there is interaction. Then, the effect of a variable depends on the level of the other

38. In an interaction model, coefficient of variables does not have the same meaning than in those cases where there is no interaction
39. Systematic revisions increase sample size and reduce random errors
40. Right censoring in survival studies comprise: (a) conclusion of the study before the event of interest occurs; (b) death due to another cause than that regarded as an event of interest; and (c) lost to follow-up
41. Survival probability  $[S(t)]$  is the probability that an individual may live for a determined period of time
42. Survival analysis does always compute the median
43. The size of the sample has little influence on the qualitative research
44. The logistic regression model is multiplicative
45. It is always necessary to carry out a good descriptive statistical study. Otherwise, it is equal to carrying out an inadequate medical history

### C) Epidemiological aphorisms

46. The art of epidemiology includes the ability of obtaining reasonable answers from imperfect data
47. Health and disease are not random phenomena
48. In case-control studies, research goes backward, from effect to exposure
49. In transversal studies, time cannot be seen

### D) Short epidemiological phrases

50. A number needed to treat (NNT) over 10 is unacceptable
51. A ratio is a quotient between two absolute frequencies, where the numerator is not included in the denominator
52. The term odds is a type of quotient used to express the quantitative relation between the probability that an event may occur, as in the case of a disease, and the probability that it may not

53. A proportion is a type of fraction in which the numerator is included in the denominator
54. As to paired case-control studies, the statistical analysis must take into account the pairing process. Conditioned logistic regression is the method of statistical analysis
55. Two selection biases concerning case-control studies are those known as Berkson's bias (it is worth bearing in mind the intrinsic differences of case-control data collected from hospitals and the community) and Neyman fallacy (a higher proportion of survivors in prevalent cases)
56. Case-control studies are useless for determining incidence rates
57. The main goal of a case-control study is to provide a valid and reasonably precise estimate of the strength of association of a hypothetical cause-effect relation
58. In health services, efficiency is attained by the achieving of a goal using the less possible resources and with the aim of increasing the well-being of the population to whom it is addressed
59. In an open cohort, the incidence density is the only factor that can be studied: Incidence density = number of new cases divided by  $\sum$ time at risk/people per year
60. The first epidemiological transition took place after the World War II when cardiovascular diseases and cancer began to be the main causes of death rather than infections
61. There is a great deal of bias in an epidemiological indicator in which the numerator and the denominator come from different sources
62. In ecological studies, only the extremes can be obtained from contingency tables
63. Two epidemiological measurements of transversal studies comprise: (a) prevalence quotient, which does not permit their introduction into a multivariate model, and therefore does not either permit the control of the confusion and (b) prevalence odds ratio, which does therefore permit the control of confusion
64. Social desirability bias involves giving a politically correct answer to an opinion poll

65. Questionnaire and opinion poll are not the same concepts in qualitative research

### E) Epistemological aphorisms

66. To research is to measure
67. Continuous variables are the jet set of variables
68. God never said that all regressions should be linear (R. G. Millar)
69. Scientific research is an act of intellectual rebellion
70. As to scientific thought, transparency is crucial
71. A model is an abstraction of reality. A sample is a model of the population
72. Randomness does not guarantee representativity, but objectivity
73. The nucleus of the Bayesian logic includes the gradual integration of information
74. Decisions are dichotomic. Assessments concerning hypotheses are not dichotomic. They gain or lose credibility
75. God would never give a confidence interval
76. With regard to survival analysis, time can be defined at one's discretion, as long as it makes sense
77. In qualitative research, we look for meanings right from the meaning of things
78. The fact about methodological flexibility, inherent to qualitative research, and the need to express a working hypothesis is in itself a paradox
79. In qualitative research issues, truth is a slippery concept
80. Imagination to power

### F) Short epistemological phrases

81. In the scientific sphere, hypotheses are never thoroughly accepted, although in the theological sphere, they possibly are
82. Any research work must be carried out on a problem that can be posed as a question
83. According to the Royal Spanish Academy, deconstruction is the process of dismantling a concept or an intellectual construction through analysis and thus discloses contradictions and ambiguities
84. Definitions are, quoting Karl Popper, read from right to left

85. The only allusion of the words Science and Technology reveals the opposition of both concepts: science is related to knowledge, while technology refers to the use of knowledge

86. Paradigms are universally acknowledged scientific achievements, which for some time have provided models of problems and solutions to the scientific community. They come from the philosophical work of Thomas Kühn
87. Thomas Bayes grasped the significance of developing a quantitative and exact theory of inductive reasoning
88. A scientific hypothesis should never be dropped for lack of statistical significance. Data can show an increase in likeliness despite the lack of significance
89. Science is achieving changes of paradigms in the course of time
90. The official thesis concerning the estimation of the sample size begins with an illogical approach, since it demands to speculate on a sampling parameter
91. There are seven requirements to make a research work ethical (E. Emanuel): (1) it must be worth it; (2) it must have scientific validity; (3) it must carry out an equitable selection of individuals; (4) there must be a convenient risk/benefit proportion; (5) it must undergo an independent assessment; (6) it must be provided with informed consent; and (7) it must be respectful with the individuals included in the work
92. Research through opinion polls and questionnaires quantifies what is qualitative

### G) Aphorisms on scientific diffusion

93. Nobody puts a candelabrum under a table
94. English is the Esperanto of science
95. The summary is the offspring of the research work
96. No one is born an orator, but becomes one

### H) Short phrases on scientific diffusion

97. Discussion on a research work should begin by discussing biases and end discussing causality criteria
98. With regard to drafting a research protocol, a second bibliographical revision tends to be

- less intense than the first one
99. The researcher must, during his/her career, upgrade the diffusion process.
  100. Acknowledgments for original articles should be addressed to persons
  101. The features of a good title at the head of an original article should comprise the following: (2–3 descriptors) + (2–3 conjunctions) + (2–3 prepositions)
  102. Tables included in an original article must contain logic and order
  103. Original articles publishing results of a qualitative research through questionnaires should avoid the use of baroque style
  104. In PowerPoint presentations, one should avoid the abuse of capital letters, while keeping the coherence of the background of slides
  105. Debates after an announcement are necessary and must exist as a form of culture

#### **I) Pragmatic aphorisms**

106. All that glitters is not gold
107. If you add rubbish to a statistical analysis, you get rubbish
108. Knowledge is spread, technology is patented
109. I am a hostage to my confidence intervals
110. Science is not a democracy; it cannot be put to the vote
111. We must reach the maximum admissible sampling error for our research work
112. A good design is more important than a good analysis
113. As to questionnaire designing, stylistic figures should be avoided; one must go straight to the point
114. There is no real consensus on what public opinion is
115. Let data speak by themselves
116. It is worth bearing in mind what to answer
117. Do not mess around with the assessor

#### **J) Short pragmatic phrases**

118. The most frequent causes for the rejection of a research project are as follows: (a) lack of originality; (b) a badly structured summary; (c) a scarce respect for the scientific method; and (d) a careless selection of the type of study to achieve the goals in mind
119. VIA = Validity, Important, Applicability

120. The sector diagram is a piece of cake for each frequency
121. An analysis should be developed bearing in mind the design
122. In general, it is preferable not to categorize continuous variables
123. In a gross analysis, odds ratios are interpreted as indicated by the frequencies shown on the upper left corner of contingency tables (Box 1) (tetrachoric table)]
124. As to rate problems, standardize through a variable is equal to control through that variable
125. In diagrams developed for survival studies, right censoring is the most frequent censoring
126. In questionnaire designing, it should be advisable to avoid bias contagion among questions, that is, to avoid the halo effect
127. In the course of an oral presentation, it is important to look at all the audience while speaking

## **DISCUSSION**

A group of 10 post-graduated students, who were included in a focus group, have collected 127 pedagogical aphorisms and short phrases in a course given by the Andalusian Public Health School (Granada). The group has tried to identify those teachers with a higher interpretative load; also, the students designed two concept maps to better visualize the resulting classifications.

The most important bias of this research work is the approach it has in the final phase of the course and in the earlier subsequent period. The students' motivational factor derived from the process of carrying out the project, from the scientific experiences they underwent, their reunion with their teachers, and the materials used in the intranet during the course (virtual campus).

The control of bias has been determined by the size of the focus group, which we have regarded as acceptable for a qualitative research work like this, by the immediacy in the execution of the work, thanks to "fresh" information provided just once the course was over, and by the possibility of having access to the specific virtual campus even until a year after the course was over. We believe there is another aspect controlling the bias of the

information reported in this paper, and it is an aspect represented by the diverse medical specialties of the members belonging to the focus group and whose specialties are listed in “Methodology.” At the end of the course, each student is able to assess the most relevant pieces of information that he/she may have assimilated.<sup>[38]</sup> Articles with a quantitative design have the capacity for the generalization of data and other biases; as to qualitative research, these concepts are also observed during the qualitative research, although within a different approach.<sup>[42]</sup>

We felt it was necessary to carry out a basic triangulation with an adequate descriptive language and an unequivocal statistical process in order to analyze the work of the two most quoted teachers of the group.<sup>[39-40]</sup> There is a work published by McMillan on Odontology that describes a reasoning idea very similar to ours.<sup>[43]</sup> Differential components are greater than the common ones.

To have a clear thinking and well-founded concepts should be the basic features of any researcher who begins his/her career.<sup>[44]</sup> Sometimes, the planned composition of a curriculum implies to leave aside time-consuming projects that would not yield the expected results despite the efforts invested in them. In this regard, aphorisms and pedagogical phrases save time in the daily work of a researcher during the training process.<sup>[11,21,30,44]</sup>

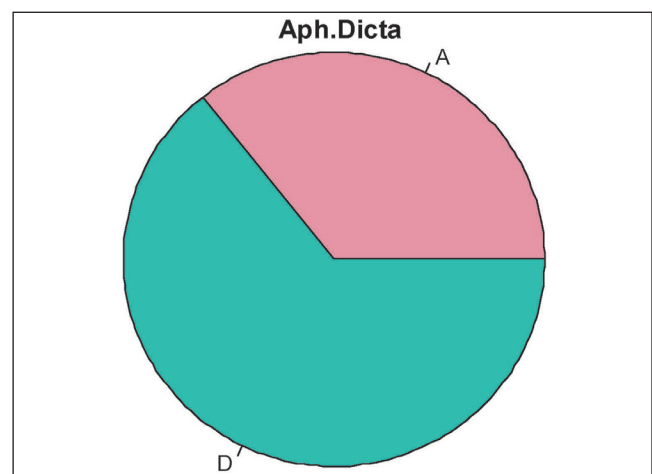
As to early postgraduates, it is essential to follow a training course in both general skills and research methodology. For years, efforts have been focused on the training of younger health care professionals in problem-based learning (PBL).<sup>[45,46]</sup> A lot of controversy has been raised as to know when a person is well trained, and what this person knows or is able to carry out. The hustle and bustle on concepts belonging to both the general and specialist medicine has been continuous. Thanks to the unfolding of both artificial intelligence and blurred logic,<sup>[45,46]</sup> today’s newest conception on expert knowledge opts, after a lot of years of studying and specific training, for specialization. The idea of an “expert generalist” is difficult to specify within the explanatory system of expertise studies.<sup>[45,46]</sup> Eventually, most people tend to cognitively organize the information received and store it in great units, or knowledge drawers. This manifest evidence was discovered by analyzing the knowledge of chess players.<sup>[47]</sup>

Metacognition is the awareness of one’s knowledge and of one’s way of doing things. It is related to what an individual knows about his/her cognitive process. Metacognitive activities, implicitly or explicitly, allow and underlie in the development and achievement of the dynamics of expertise.<sup>[45-49]</sup> We believe that the contents of this article can positively help develop cognitive and metacognitive aspects described in previous paragraphs. They also provide a creativity profile for the continuous<sup>[50,51]</sup> and post-graduate training.<sup>[52]</sup>

Although the scientific language is characterized by its accuracy, simplicity, and positivity, we want to highlight the use of metaphors as a useful tool in the teaching and learning of health care knowledge.<sup>[53]</sup> We expressly want to make reference to the metaphors included in the following elements: 4, 9, 67, 68, 69, 75, 80, 93, 95, 105, 107, 109, 110, 115, and 117. Number 80 illustrates the most famous history phrase of the French Spring of 1968 by stimulating the researcher’s imagination to perform an oral presentation of his/her work.

We have organized all the data collected in statistical,<sup>[54,55]</sup> epidemiological,<sup>[56-60]</sup> epistemological,<sup>[61]</sup> diffusion, and pragmatic (or heuristic)<sup>[62,63]</sup> elements, and we think we have done it in an unusual way since this type of classification is new and has been used in this article for the first time.

We cannot comment one by one the 127 informative elements included in this research [Figure 2]. We shall only refer those elements that the focus group considered interesting or needed a complementary explanation of the texts shown in results.



**Figure 2:** Distribution of the Information in Aphorisms (A) and Short Phrases with a Pedagogical Value (Dicta)



In the element number 115, for instance, “Let data speak by themselves” – classified as a pragmatic aphorism – illustrates the Newtonian idea of induction.<sup>[64]</sup> With the use of new technologies, even data will be able to speak to other data thanks to the exchange of information traveling through research networks.<sup>[65,66]</sup> Data’s structure can possess their own semantics.<sup>[67,68]</sup> The element 109, “I am a hostage to my confidence intervals,” constitutes a heuristic aphorism that emerged in the classrooms and which illustrates the relations that are present in the estimation of the sampling size and the standard error.<sup>[69]</sup>

The element number 9, classified as a statistical aphorism, notes the mathematical value of the coefficient of determination in a linear regression model, with respect to the lesser value of, for example, the remoteness analysis in a model of logistic regression.<sup>[70]</sup>

Many students and researchers fail to differentiate the two directions of conditional probability  $P(A/B)$  and  $P(B/A)$ , where this is an error called fallacy of the transpose conditional or fallacy of conditioning factors; that explains the significance of the element 23 and its classification as statistical phrase.<sup>[71]</sup> To us, the short statistical phrase found in the element number 36 is of remarkable significance as it reports the relevance of multilevel regression in pedagogy,<sup>[72]</sup> and it is due to the special adaptation of this analysis method for the educational background at any level. Short statistical phrases 15 and 17 do refer to the meaning that  $\beta_0$  has (independent term/corner) in the linear regression model (centering of predictor) and in logistic regression model (it only can be achieved mathematically in the cohort design).<sup>[70,73]</sup> The natural design used in the interpretation of the independent term ( $\beta_0$ ) is that used in a cohort, where the exposition level is known and the health level is prospectively assessed after some time.<sup>[70]</sup>

The short epidemiological phrase number 57 clearly differentiates the concept of association from causality found in the design of cases and controls.<sup>[74-77]</sup> The epistemological phrase of

the element number 84 describes the Popperian idea of building a definition from a concept<sup>[71,78]</sup> (Definition  $\leftarrow$  Concept).

The element number 93 is an aphorism of scientific diffusion extracted from chapter 5 of the Gospel of Saint Matthew that asserts the need to spread any accomplished research work. In these current days, the “candelabrum” should be one with a high impact factor.<sup>[79]</sup> The pragmatic aphorism included in the element number 117 warns us against embroiling too much a scientific reality, which must be simple and clear for its comprehension and for a good communication.<sup>[80]</sup>

The short epidemiological phrase number 55 describes in its first part Berkson’s bias for case–control design, which Alvan Feinstein and collaborators so masterly analyzed some years ago.<sup>[81-84]</sup> The pragmatic short phrase number 119 depicts the acronym VIA, which is so interesting within the methodological background of health based on evidence.<sup>[85,86]</sup> The element number 50, classified as an epidemiological short phrase, makes reference to NNT, a concept that is also basic within this ambit.<sup>[85,86]</sup> An NNT, when expressed correctly, must be associated with the control employed, the therapeutical result, the necessary time to achieve it, and the confidence intervals.

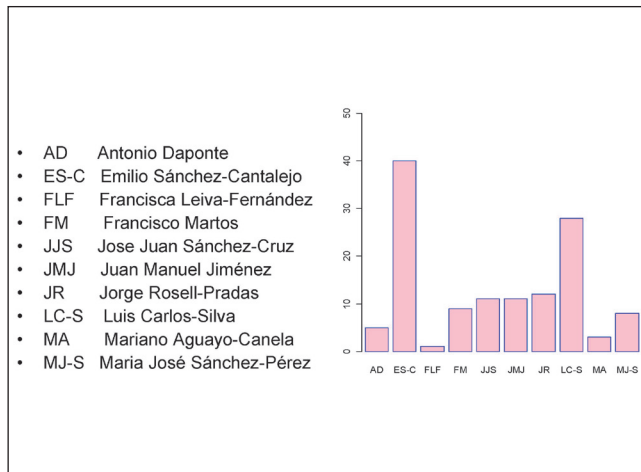
The last element to comment is number 6; it includes a statistic aphorism and is an homage to Bruno Finneti,<sup>[87]</sup> noted for the operational subjective conception of probability.

We see the occurrence of a higher percentage of elements of the statistical type (35% of the whole) as a direct result of the fact that the person in charge of the course was both a mathematician and a statistician [Table 1 and Figure 3]. Maybe in future, projects on this issue it would be advisable to put the emphasis on epidemiological contents. However, these results may be affected by the individual scientific trends of those who form the focus group, trends that have not been assessed in the study.

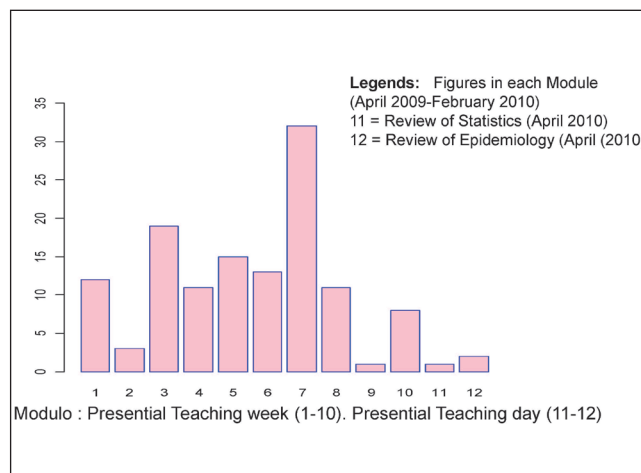
We believe this is a merely descriptive result that does not need any further comment. We can

**Table 1:** Distribution of the frequency of classifications used in this article

	Spread	Epidemiological	Epistemological	Statistical	Pragmatic
Aphorisms (n=44) (34.6%)	4	4	15	9	12
Dicta (n=83) (65.3%)	9	16	12	36	10
	13 (10.2%)	20 (15.7%)	27 (21.3%)	45 (35.4%)	22 (17.3%)



**Figure 3:** Frequency of aphorisms and short sentences expressed by each teacher



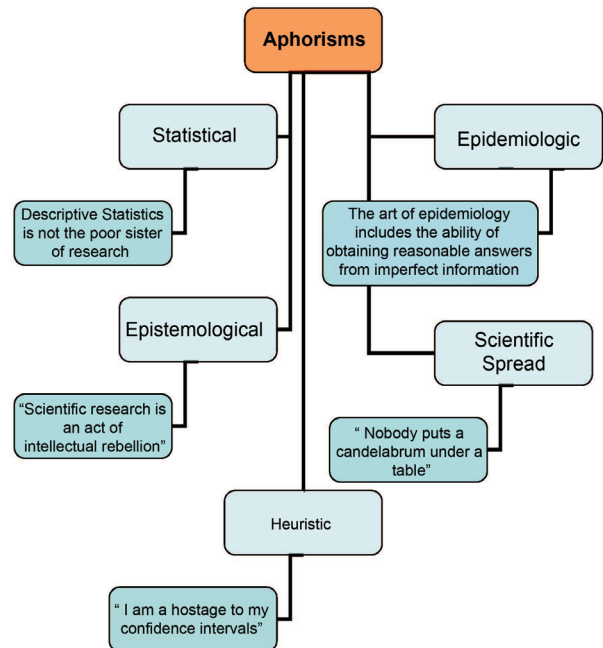
**Figure 4:** Distribution of the frequencies of aphorisms and short phrases during the course

**Table 2:** Chi-square test and Fisher’s test of the two teachers with more compiled information

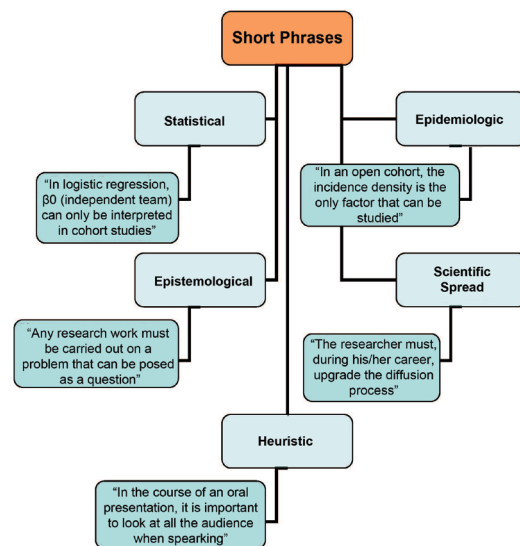
	Aphorisms	Dicta
E.Sánchez-Cantalejo	12	28
L. C. Silva	14	14

Pearson’s Chi-squared test  $P$ -value = 0.09487,  
 Fisher’s exact test for count data  $P$ -value = 0.129

clearly conclude from Figure 3 that it was two teachers who provided more data to our analysis: Emilio Sánchez-Cantalejo<sup>[70,72,88]</sup> (non-Bayesian statistician), and Luis Carlos Silva-Ayçaguer<sup>[71,88]</sup> (Bayesian statistician). The categorical analysis did not show any dependence to one group or another of aphorisms or short phrases [Table 2], although at a descriptive level, the first teacher



**Figure 5:** Aphorisms concept map



**Figure 6:** Short phrases concept map

was more in favor of short and positive messages. The pedagogical elements included in this article were more frequently expounded in the third and seventh modules of the course [Figure 4].

In order to achieve a better visual of the classification, we have drafted two concept maps which follow the guidelines of the pedagogical constructivism [Figures 5 and 6]. The selection

of contents has been carried through personalized discussion.<sup>[33-36,38,89]</sup> The focus group has somehow found a way to go ahead with this research work.

We do not want that this research work may be regarded as an anathema as a result from having approached two extremely scientific and quantitative disciplines, such as those concerning statistics and epidemiology; our goal was, using a qualitative methodology, to bridge the gap between both specialties and a real scenario.<sup>[90,91]</sup> We neither had the intention of opening a new paradigm.<sup>[92-94]</sup>

To conclude, we think this type of qualitative analysis,<sup>[38,39]</sup> which is based on the difference between aphorisms and highly pedagogical short phrases, does assist the following: firstly, the researcher to review and strengthen the contents acquired during the training process,<sup>[11,21,30,44-46]</sup> while keeping these contents operative during the process of studying reality; secondly, it allows the teacher to reflect on the frequency and arrangement of the elements that are spread (through the classrooms and into the intranet); and thirdly, it provides the teaching institution with quality control mechanisms.<sup>[16,20]</sup>

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