A COMPARATIVE ANALYSIS BETWEEN STATISTICS TOOLS IN SCIENTIFIC PRODUCTION AND DISCIPLINES IN EDUCATION AREA

Grácio, Maria Cláudia Cabrini
School of Philosophy and Science – State University of São Paulo
Avenue Hygino Muzzi Filho, 737
Marília - !7500, Brazil
E-mail:cabrini@marilia.unesp.br

Garrutti, Érica Aparecida
Master of Philosophy in Special Education
E-mail: egarrutti@yahoo.com.br

ABSTRACT
The aim of this paper is to compare statistics tools employed in scientific production in education area and those presented in teaching plans and didactic books of Statistics courses in Education. We investigated 560 papers, 107 dissertations and theses and sixteen teaching plans for Statistics with respective didactic books in Education of Education College in São Paulo state. The results indicate that in both scientific production (papers, dissertations and theses) from the field of Education and Statistics contents in teaching plans and didactic books in these plans the emphasis is on Description Statistics.

1. INTRODUCTION

Our teaching practice in Statistics has shown us how statistical knowledge can be far removed from other content taught in courses where it is instrumental in nature, particularly in the area of Human Sciences. It follows that Statistics teaching must treat questions relating to the student's reality, helping them to see how quantification is used in various daily experiences.

Sowey (1995) points out that teaching Statistics coherently means to insert it in a larger context. When students know and understand the statistical techniques taught, perceiving their meanings and implications as a whole where they are used, it widens the possibility of the knowledge becoming part of their cognitive structure and to be lasting.

Oliveira and Grácio (2003) point out that, in this context, the Statistics teacher needs to construct courses that prioritize those statistical techniques that are more pertinent to the working area of the future professional.

In this paper, we aim to compare the statistics tools used in scientific production (papers, dissertations and theses) from the field of Education and those present in teaching plans and didactic books of Statistics courses in Pedagogy College with the purpose we verify if taught contents is adequate to Education area context.

2. METHODOLOGY

We use as result of scientific knowledge production of Education field the papers published in Brazilian periodics, the dissertations and theses of the area. We analyze all papers contained in three international insertion periodics and other three ones of national insertion from 1996 to 2000 period. The select international insertion periodics were: *Cadernos de Pesquisa – Fundação Carlos Chagas*, *Educação & Sociedade and Educação & Realidade.* The select national insertion periodics were: *Cadernos Cedes,*

Educação e Filosofia and *Revista Brasileira de Estudos Pedagógicos.* In regard to the course conclusion works of Post-Graduation we analyze master dissertation and doctorate theses in Education area, argued in the 1996 e 2000 period, contained in the available heap at the College of Philosophy and Science library of UNESP, Marilia Campus. In this heap there are Post-Graduation research argued in various University: State University of São Paulo, Federal University of São Carlos, Catholic University Pontiff - São Paulo, Federal University of Rio de Janeiro, Federal University of Bahia and Campinas University. In surveyed scientific production (papers, dissertations and theses) we analyzed variables and statistics tools employed.

Concerning the statistics teaching plans of Education area, we selected 47 private and public Institutions of Superior Education with a College of Education, in São Paulo State, by means of systematic random sampling. Only fifteen institutions answered our request to send the teaching plans to us: six of them informed us that they do not have Statistics in their College of Education, and nine sent their teaching plans, for a total of 16 teaching plans. In each teaching plan, we identified the statistical techniques and tools presented in the programmatic content. Then we examine fourteen Statistics didactics books mentioned in basic bibliography of the analyzed teaching plans. In each book, we identified statistics programmatic contents presented.

3. RESULTS

The use frequency of statistics methodology in analyzed scientific production (papers and course conclusion works at Post-Graduation) is presented in table 1.

Table 1.Use frequency of statistics methodology, in absolute and relative numbers, in analyzed papers (national and international insertion) and in courses conclusion works of Post-Graduation (master dissertation and doctored these).

	Scientific Production Type											
	Periodic						Courses Conclusion Works of Post-Graduation					
	National		International		Total		Dissertation		These		Total	
Statistics Methodology	f	%	f	%	f	%	f	%	f	%	f	%
Yes	41	16	58	19	99	18	37	51	22	63	59	55
No	213	84	248	81	461	82	35	49	13	37	48	45
Total	254	100	306	100	560	100	72	100	35	100	107	100

Association between periodic type and statistics methodology: $\chi^2 = 0,57$; gl = 1; p = 0,45

Association between courses conclusion works type and statistics methodology: $\chi^2 = 0,83$; gl = 1; p = 0,36

Association between production type (paper or courses conclusion works) and statistics methodology: $\chi^2 = 67,69$; gl = 1; $p < 0,0001$.

From table 1 we observe that there is no association ($\chi^2 = 0,57$; p = 0,45) between statistics methodology use and periodic type (National or International). Statistics methodology is used in 18% of published papers. We also observe that there is no association ($\chi^2 = 0,83$; p = 0,36) between statistics methodology use and course conclusion work type (master or doctorate). Approximately 55% of the analyzed dissertation and theses use statistics methodology. By the other hand we observe that the statistics methodology use is significantly larger among course conclusion research of Post-Graduation (dissertation or theses) than among papers of Education area ($\chi^2 = 67,69$; $p < 0,0001$): 55% of course conclusion research of Post-Graduation use statistics methodology while only 18% of papers use this research methodology.

Table 2 points out that, in both papers and Post-Graduation research, the used statistics procedures are in most time is of descriptive nature. All papers, dissertations and theses present frequency tables when tehy use statistics methodology. Only a minority of papers, dissertations and theses present the Inferential

Statistics use. In teaching plans distribution the largest percentages (50% a 69%) are gotten by the following categories of statistics techniques: introduction to descriptive statistics, planning of statistical work, frequency tables, graphical presentation, measures of central tendency and measures of dispersion. Thus, the descriptive approach appears in most of the teaching plans. On the other hand, the inferential approach appears in a minority of the teaching plans with percentage lower than 19%. In didactic books the statistics tools used with percentage largest than 50% are: planning of statistical work, frequency tables, graphic presentation, measures of central tendency, measures of quantiles, measures of dispersion, notions of probability and correlation and regression. This fact points us out that as well as in teaching plans, the approach of analyzed statistics in didactic books contents is basically in approach of Descriptive Statistics.

Table 2. Statistics tools categories in papers, dissertations/theses of Education area, teaching plans and didactic books.

STATISTICS TOOLS CATEGORIES	Papers %[1]	Dissert/Theses %[2]	Plans %[3]	Books %[4]
Notions of Mathematics	-	-	19	43
Introduction to Descriptive Statistics	-	-	50	50
Planning of statistical work	-	-	50	64
Frequency Tables	100	100	69	86
Graphic presentation	21	51	62	78
Measures of central tendency	14	14	62	86
Measures of quantiles	-	2	38	57
Measures of dispersion	4	2	69	78
Notions of probability	-	-	44	57
Binomial distribution	-	-	6	36
Normal distribution	-	-	38	43
Measures of skewness and kurtosis	-	-	19	21
Introduction to Statistical Inference	-	-	12	36
Estimation of population parameters	-	-	12	14
Tests of Hypotheses	6	8	12	43
Analysis of Variance	-	2	6	7
Correlation and Regression	7	-	19	57
Indices numbers	-	-	-	21

1 Calculated percentage considering the total of 99 papers with statistics analysis
2 Calculated percentage considering the total of 59 dissertations and theses with statistics analysis
3 Calculated percentage considering the total of 16 analyzed teaching plans
4 Calculated percentage considering the total of 14 analyzed didactic books

4. DISCUSSION

The results point out that a small percentage (18%) of papers use statistics methodology in the treatment of the questions raised, and 55% of dissertations and theses use statistical methodology for the analysis of their data. Among the papers, dissertations and theses that use statistics, all use tables of frequency distribution in presentation of their data. Inferential statistics techniques are rarely used (below 10% of the analyzed research) and are predominantly of non-parametric nature.

Looking for getting a teaching practice diagnosis in the Statistics disciplines to College of Education, we developed an analysis in teaching plans. We admit the diagnosis limitation of the results by means the analysis of documents that represent a kind of “intentions letter”. We considerer that it is indispensable that contents are selected by means of a critical analysis that classifies them as essential or secondary for students. The students’ professional field reality must be the starting point.

The programmatic content presented in the teaching plans, in general, emphasizes techniques of Descriptive Statistics such as frequency tables, graphical presentations, measures of central tendency, quantiles and measures of dispersion.

Comparing the statistics techniques categories found in the analysis of teaching plans with those ones found in the area researches (papers, dissertations and theses), both the teaching plans and the research make greater use of descriptive techniques. Among the nine analyzed institutions, all plans present use of Descriptive Statistics, while only three institutions mention Inferential Statistics techniques.

Proceeding the analysis of Statistics didactic books we point out that the programme contents emphasized in these books is basically on Descriptive Statistics approach.

5. FINAL CONSIDERATIONS

We emphasize in teaching work the relevance of a constant reflection about subject linked to the solutions search to diverse problems found in knowledge area in which Statistics is inserted. In the process of organization in the teacher's work, we emphasize the importance of the contents of the Statistics subject, with an interdisciplinary perspective for the development of a contextualized study.

The results about statistics tools employed in scientific production in Education area lead us to consider that the organization and the content of the Statistics subject for Education students must emphasize the development and the interpretation of Descriptive Statistics, so that the taught contents are in accord with the necessities of the future educator. But the content of the Statistics must not omit the presentation of Inferential Statistics. We must point out to the students the importance of the use of hypothesis tests when one works with samples and want to extend the results to a population. The exception refers to a college that, in its third teaching plan, presents only the use of Inferential Statistics tools, to know: tests of hypotheses, analysis of variance, correlation and regression. The programme contents of the three plans are organized in a cumulative structure. Firstly it is worked elementary contents that go becoming more complex until it treats about inferential tools.

Concerning the analysis of statistics didactic books, as well as in teaching plans, theirs contents approach is on descriptive statistics tools. We verify that statistics tools presented with percentage larger than 50% are: planning of statistical work, frequency tables, graphic presentation, measures of central tendency, measures of quantiles, measures of dispersion, notions of probability and correlation and regression. In this way, we point out the adequacy of the last (teaching plans and didactic books contents) to the area whose they are destined, that is, the adequacy of statistics knowledge to largest objective of professional formation area.

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