A NEW APPROACH IN THE PREPARATION OF PRINTED MATERIAL OF THE STATISTICS FOR DISTANCE LEARNING

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Marcelo Tavares - Universidade Federal de Uberlândia

(mtavares@ufu.br)

Claudinê Jordão de Carvalho - Universidade Federal de Uberlândia

(jordao@ufu.br)

SUMMARY:

New technologies are a constant challenge for teaching. The teacher has to look for educational resources that address the context of the learners and at the same time challenge us to build new knowledge. This paper aims to present a new approach in the preparation of material print (book) for the discipline of the exact sciences, more precisely statistic was based on the book "Applied Statistics Management" developed by prof. Marcelo Tavares, Faculty of Mathematics, Federal University of Uberlandia, for the Open University of Brazil, which has the program PNAP (National Training Program in Public Administration).

Key words: *new technologies, statistical administration.*

1. Introduction

Think about the knowledge built at the university today, requires a detailed look at the many opportunities that technology presents. In this context, is also changed as the role of the apprentice, the student is required because a more autonomous and responsible about their learning. It is for the teacher and the apprentice to find alternatives to the construction of knowledge happens in a less centralized, and contextualized with the technological universe.

Books can be worked as a deepening of topics, research, simulation, case study, analysis of situations, a range of opportunities that allow flexibility, looks different, study of theory through reflection proposal. As the needs and interests of the teacher to work and explore the learning objects in their academic activities, both for teaching, for research and extension, he can count on one more alternative to assist in its activities.

For Leffa (2003), the construction of teaching materials includes the following main steps: needs analysis, development, implementation and evaluation. Therefore, detailed planning, student needs, expectations, previous knowledge and learning styles are essential for the teacher to find meaning in working with learning objects.

This article aims to explain the development of a different methodology of preparation of material (books) in the area of statistical support for distance education.

2. Statistics

An important and fundamental to many stochastic problems is that they do not have a single solution Mathematics. Judgments and inferences of students expected (predictions about a population based on sample data collected by students in a survey) very often can not be characterized as right and wrong, but evaluated in terms of quality of reasoning, adequacy of methods employed, nature of data and evidence used (Garfield and Gal, 1999).

In discussing the acquisition of mathematical knowledge, which is to understand basic statistical knowledge, ideas Skovsmove (1994) are presented as an articulation point and should be more present, because this way, we can develop different ways of understanding . Thus, students begin to be able to produce surveys and logical conclusions about the knowledge of mathematical and statistical concepts, using known facts, properties and relationships to justify their answers and resolution processes, using past relationships and to see that the situations where the mathematics and statistics can be applied.

When we use forms of learning in which we work handling and testing of materials, there is not a development activity unconnected, but the creation of conditions conducive to the development of abstract thought. The teaching activities must enable students to research staff on significant problems for them, that is associated with your daily life or area of training and demonstrate well the application of statistical concepts. Thus there is a flexibility in producing materials for mathematics and statistics from the context and the development of students, considering the conceptual and procedural content, enabling the construction of knowledge of statistical concepts.

Regarding the probability, if its definition was guided only in its mathematical definition, the capacity for understanding becomes deficient. Therefore, the difficulty of students has not been focusing on the definition of probability, but rather in how the term is interpreted and applied appropriately in specific situations (Azcárate, 1996). Problem solving, which is the guiding principle of learning mathematics, can enable the development of work with statistics and probability in the classroom, because just as Mathematics, Statistics also developed by solving problems of an practice in human history.

Thus, we must understand that problem is not an exercise in application of concepts recently worked, but the development of a situation that involves interpreting and devising a strategy for resolution. Pozo (1998) believes that

working problems in mathematics means putting into action certain skills of inference and reasoning in general.

According to Lopes (1998) Statistics and probability are key issues of education for citizenship, since they enable the development of critical analysis in different scientific, technological and social. And more than ever, it is necessary, and is the school, take this knowledge for every citizen in the historic moment we live in, the statistic is present in daily life.

3. The proposed model for the presentation of statistical concepts.

This work was based on development experience of the material (book) "Applied Statistics Management" developed by prof. Marcelo Tavares, Faculty of Mathematics, Federal University of Uberlandia, for the Open University of Brazil, which has the program PNAP (National Training Program in Public Administration).

In the presentation of the material is presented to the student (reader) and the main objective manner with which he must deal with statistical concepts, questions and how to study.

The following are some excerpts from this presentation:

"The ultimate goal is that you have the opportunity to expand their knowledge about the world of statistics. Thus this book will not be made, deductions and mathematical proofs of expressions. Will be sought a more abstract understanding of the terms to be used. "

"For you to generate tables, graphs and statistical techniques we use a multitude of comprehensive software that makes it automatically. However, if we find out what answers they can give us the data for specific questions, you need to know the statistical theory and practice their applications through case studies or situations. "

"How to study the distance the content of the discipline of statistics? Studying is a job that requires intellectual discipline that can not be won unless practicing it. Requires us to systematic critical attitude. Instead of placing liability and agree with everything it says, you should doubt, challenge, criticize, comment and find out what the author means. The act of study requires you to do exercises and understand what it's doing, not being a mere executor of formulas. This entails understanding the concepts presented in this book. Since reading is an activity, you must be active. Be sure that a student can learn more than the other in that it applies more and is capable of a larger activity of reading. And you learn better if demand more of himself and the text you have before you. "

"I wish you good studies!"

"Professor Marcelo Tavares"

Within this context, we sought to develop ways to present concepts and structured differently, thus forming the reasoning.

Take for example the development of a figure containing the phases of the statistical method.

Thus the student (reader) is building the structure of a figure. This reasoning is shown in Figure 1 which shows a part of the book, developing a structured way to a better understanding of concepts partial and final on the subject. After this construction of structured concepts, we present the final frame (Figure 2).

Another example is where the explanation of different types of variables and relations between them. A portion of the text is presented in figures 3 and 4.

Como atividade, pense agora em outros problemas relacionados a gestão pública e que merecem ser resolvidos

Vamos agora a primeira parte do nosso desenho

Definição do problema

1.1.2.Planejamento

Após você definir o problema, é preciso determinar um processo para resolve-lo e, em especial, a forma como obter informações sobre a variável ou variáveis em estudo. É nesta fase que se decide pela observação da população ou de uma amostra. Portanto você deve:

- determinar os procedimentos necessários para resolver o problema, em especial, como levantar informações sobre o assunto objeto do estudo;
- planejar o trabalho tendo em vista o objetivo a ser atingido;
- escolher e formular corretamente as perguntas;
- definir o tipo de levantamento: Censitário ou por Amostragem;
- definir cronograma de atividades, custos envolvidos, delineamento da amostra, etc.

Veja você, que agora inserimos esta etapa estudada.

Definição do problema

Planejamento da pesquisa

Figure 1. Part of the book, showing the development of part of the reasoning phase of the statistical method.
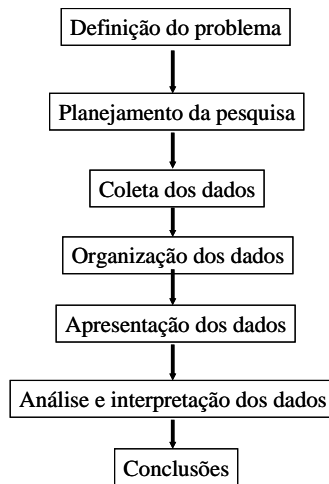
Figure 2. Part of the book, showing all phases of the statistical method.

Para isto então você deve entender a classificação das variáveis. Então, mãos a obra e vamos lá:

➔**Variável Qualitativa:** refere-se a observações relacionadas a atributos que não apresentam estrutura numérica, como por exemplo, cor dos olhos, classe social, estado civil, nome da empresa, etc.

Esta variável qualitativa pode ser classificada em:

- **Nominal:** Estas observações não apresentam nenhuma hierarquia ou ordenamento, como por exemplo, sexo dos funcionários de uma prefeitura, estado civil, estado da união em que uma pessoa nasceu, etc.
- **Ordinal:** Estas observações apresentam uma hierarquia ou ordenamento, como por exemplo, cargo do funcionário em uma empresa (diretor, gerente, supervisor, etc), posição das empresas em relação a pagamento de impostos em um município (primeira, segunda, terceira, etc)

Como atividade dê outros exemplos de variáveis qualitativas que não sejam as mostradas anteriormente.
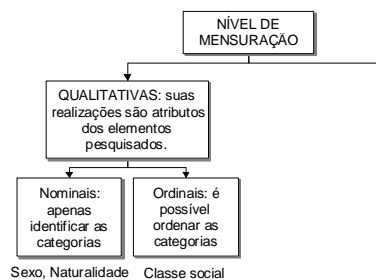

Figure 3. Part of the book, showing the development of part of the reasoning related to the concept of variables.
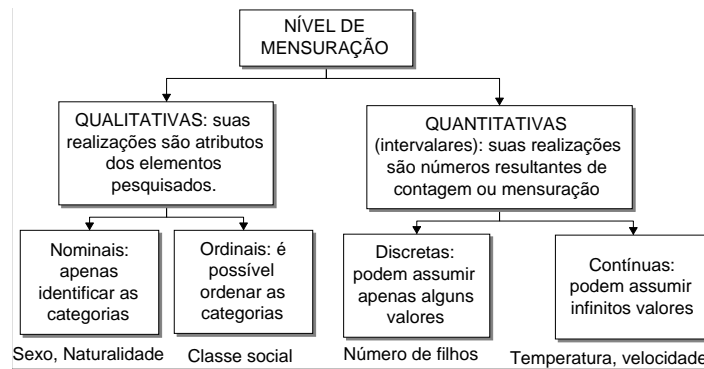
Figure 4. Part of the book, showing the final development of reasoning related to the concept of variables.

At the odds, more precisely in the case of the binomial distribution is presented a situation that is resolved by means of probability concepts presented earlier (another drive) and only later that shows the probability function, thus making the student (reader) to understand abstractly, ie without mathematical proof, the probability function.

Para exemplificar a utilização da distribuição binomial, você deve considerar que pessoas entram em uma loja no período próximo ao dia das mães. Sabe-se que a probabilidade de uma pessoa do gênero masculino comprar um presente é de 1/3. Se entrarem 4 pessoas do gênero masculino nesta loja, qual a probabilidade de que duas venham a comprar presentes.

Se as 4 pessoas entram na loja e duas delas compram, podemos colocar as possibilidades da seguinte forma (C ➜ compra e não-C ➜ não compra). O espaço amostral associado ao experimento é:

C, C, não-C, não-C ou C, não-C, não-C, C ou C, não-C, C, não-C ou
não-C, não-C, C, C ou não-C, C, não-C, C ou não-C, C, C, não-C

Logo, calculando as probabilidades usando as regras do **"e"** (multiplicação pois são independentes) e do **"ou"** (soma), a **probabilidade de 2 clientes do gênero masculino comprarem presentes** é:

$$p = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} + \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{1}{3} + \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{2}{3} + \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{1}{3} + \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{2}{3}$$

$$p = 6 \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}$$

$$p = 6 \cdot \left(\frac{1}{3}\right)^2 \cdot \left(\frac{2}{3}\right)^2$$

$$p = \frac{24}{81} \cong 29,63\%$$

Agora vamos calcular utilizando a função de probabilidade apresentada anteriormente e verificar que o resultado será o mesmo.

$$P(X = 2) = C_4^2 \cdot \left(\frac{1}{3}\right)^2 \cdot \left(\frac{2}{3}\right)^2 \cong 0,2963 \ ou \ 29,63\%$$

Figure 5. Part of the book, showing the calculation of the probability of a situation that fits the binomial distribution and subsequent calculations using the likelihood function.

6. Concluding Remarks

This form of presentation and learning strategy used in the preparation of statistical material used in the context of distance education as a strategy for learning the construction of reasoning structured exercises with resolutions commented, scheduled activities and links for use free software for data analysis.

Moreover, there was an intense background of the exercises and situations within the area of public administration. This format will allow students to distance has a better understanding of statistical concepts, since normally there is some aversion of students to disciplines in the areas of accurate, mainly statistics.

7. References

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