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Editorial in English

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This special edition of Revista Educação Matemática Pesquisa, of the Graduate Studies Programme in Mathematics Education of PUC-SP, is dedicated to Statistical Education. This issue brings 17 articles, gathering 29 researchers from Brazil, 13 from Spain and one from Italy, who participated in the I Spanish-Brazilian Seminar on Statistical Education, conducted by the Working Group on Statistical Education – GT12, of the Brazilian Society of Mathematics Education – SBEM, in partnership with the PAI - FQM-126 GROUP: Theory of Mathematics Education and Statistical Education, of the University of Granada - Spain.

The internet and social networks, increasingly important in people's lives, began to spread throughout all levels of communication and information owing to the physical distancing imposed by the Covid-19 pandemic. This was no different with education. Although designed to take place face-to-face at the University of Granada in May 2020, the Seminar was held virtually due to the restrictions imposed by the illness.

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In the first article of this special issue, Ángel Alsina and Luis J. Rodríguez-Muñiz discuss the role of Twitter® as a professional development tool for mathematics teachers in the teaching of statistics and probability in early childhood and elementary education.

In the second article, José Antonio Garzón-Guerrero, Carmen Batanero, and Silvia M. Valenzuela-Ruiz argue about the need for statistical meaning in the formation of critical and reflective citizens when confronted with information, such as the evolution of the Covid-19 pandemic. The authors defend the need to complement the teaching of statistics with a more significant diversity of graphs than those included in the curriculum and propose that the graphs disseminated by the media, international, and governmental organisations can be used by teachers as didactic resources to improve students' statistical sense.

Also on graphic representations, Leandro do Nascimento Diniz and Ivanise Gomes Arcanjo Diniz analyse the research results portrayed in monographs and articles of the Research Group Mathematics Education in Recôncavo da Bahia - GPEMAR - on the interpretation of statistical graphs. The studies analysed also included levels of understanding and sociocultural aspects.

Irene Mauricio Cazorla, Miriam Cardoso Utsumi, and Carlos Eduardo Ferreira Monteiro highlight the importance of transnumeration in transforming raw data into statistics (tables, graphs, and summary measures) and interpreting their meanings. To this end, they reflect on theoretical aspects and possible pedagogical implications of transforming raw data into statistics, and of these into information, aiming to assist the teaching of statistical concepts in basic education, standardised by the National Common Curricular Base.

Celso Ribeiro Campos and Andréa Pavan Perin suggest the paradidactic book as a resource to deal with the statistical concepts required in the National Common Curricular Base. According to the authors, besides bringing the contents more in-depth, the paradidactic book encourages reading and may favour students' taste for mathematics. Thus, their article brings a survey of academic works focused on a statistics paradidactic book for the basic school and presents a

proposal for a paradidactic book to work with graphics of measures of central tendency and dispersion in the last years of elementary school.

Cileda de Queiroz e Silva Coutinho and Amari Goulart analyse, in the light of the anthropological theory of the didactic, the mathematical and didactic organisations of the chapters intended for probability present in textbooks used in Brazilian public schools. According to the analyses carried out, the authors find mathematical organisations limited to know-how whose raison d 'être is no longer significant in the school as an institution. Regarding didactic organisations, they observed a technicist tendency, that is, types of tasks that require only a procedural approach, without calling for the mobilisation of concepts to solve the exercise.

Jocelyn D. Pallauta, Pedro Arteaga, Nuria Begue, and María Magdalena Gea analysed the level of semiotic complexity, together with the contexts proposed by PISA, of statistical tables in 18 Spanish textbooks intended for high school education. The results show the increasing complexity of the type of statistical table as the school year progresses and an increase in tasks without a context, especially in the last year of high school.

Auriluci de Carvalho Figueiredo sought to identify cognitive aspects of table construction and probabilistic knowledge in Brazilian students of a mathematics teaching degree course. The activities involved knowledge relevant to the collection, representation, reading, and interpretation of data in double-entry tables. The prospective teachers could organise the data in a table and cross the categories in rows and columns to refer to the intersection of events. However, in conditioned events, they showed difficulties both in formalising issues and in solving them.

Considering that probabilistic reasoning should be an educational priority, Pablo Beltrán-Pellicer and Belén Giacomone present the design and foundation of a didactic sequence for teaching probability in the initial years of middle school (12-13 years). The sequence is located

in a teaching approach through problem solving, based on the articulation of three meanings of probability in middle school: intuitive, frequentist, and classic. The sequence addresses the resolution of problems through games, modular origami, and visualisations of fragments of series, which establish connections with other content and influence the affective domain.

André Fellipe Queiroz Araújo and José Ivanildo Felisberto de Carvalho discuss the didactic-mathematic knowledge of prospective mathematics teachers and middle/high school mathematics teachers on the articulation between statistics and probability through the normal curve. The study was based on the theoretical model of didactic-mathematical knowledge and competencies of the teacher – DMK, developed within the scope of the onto-semiotic approach to mathematical knowledge and instruction – OSA. The results indicate that the participants could advance in constructing, resignifying, and expanding their didactic-mathematic knowledge of articulating statistics and probability.

Suzi Samá and Marta Élid Amorim analysed a process of mathematics teachers' initial education on basic notions of statistics. The study was planned and analysed based on the six dimensions of the theory of didactic suitability. In the article, the authors analyse the affective and the epistemic dimensions. The results indicate that although the students perceived the importance of statistics, they found it difficult to apply statistical concepts in the practical situations developed throughout the project. On the other hand, the management of the investigative process made it possible to resume the concepts addressed in the discipline and highlight their contribution to the understanding of the phenomenon under study.

Angelica da Fontoura Garcia Silva, Maria Elisabette Brisola Brito Prado, Ruy Cesar Pietropaolo, and Tiago Augusto dos Santos Alves analysed the professional knowledge of the teachers of the final years of elementary school and high school of the teaching of measures of central tendency (MCT). Data were collected in two phases: diagnosis and formative process. The results showed that such formative practices could be developed in other contexts in both

initial and continuing education courses, enabling other teachers to expand their views on this theme focused on statistics teaching.

In the article by María del Mar López-Martín, Rocío Álvarez-Arroyo, and Antonio Francisco Roldán López de Hierro, the authors aim to detect and categorise the semiotic conflicts prospective teachers of high school and undergraduate courses may have based on the proposition of the null hypothesis and alternative of a hypothesis test. The results reveal representational, procedural and, for the most part, conceptual conflicts, indicating, in some cases, a poor understanding of the logic of hypothesis testing. The information obtained in this work meets the results pointed out in previous research with students, which raises a possible link with the prospective teachers' knowledge and, therefore, the need to improve their education on this content.

Magnus Cesar Ody, Lori Viali, and Cassio Cristiano Giordano analysed information obtained from university students in work with critical statistical education. Several undergraduate courses from a university in Porto Alegre were represented, and the materials were obtained in the second semester of 2020 during the course Introduction to Statistics. In the results, texts and infographics about various topics emerged, depending on the interdisciplinary nature and the students' professional profile. Critical statistical education proved fundamental for students to overcome the difficulties in understanding the statistical concepts.

The study of attitudes towards the probability teaching of undergraduate students in science and technology was addressed in the chapter by Ailton Paulo de Oliveira Júnior, Nilceia Datori Barbosa, and Anneliese de Oliveira Lozada. Through a confirmatory factor analysis (CFA), 492 students from a federal university in the state of São Paulo were assessed, relating different qualitative and quantitative variables. The results pointed to negative connotations regarding satisfaction in dealing with issues related to probability but presented positive aspects related to their usefulness for the labour market. The investigation also highlighted that the students'

attitudes differed depending on gender, age, whether they worked or not and whether they attended the course in the ideal period proposed by the curriculum structure.

Fernando G. S. da Silva, Luciane de S. Velasque, and Ana G. C. do Nascimento developed a systematic review of the productions on statistical education in basic education in Latin American countries between 2014 and 2019. Through the PICo strategy, they read titles and abstracts of 43 papers selected by conventional criteria. Another 220 articles were included in the search made through Google Scholar. The results showed Brazil as the largest producer of statistical education articles, focusing on basic education, teacher education, use of digital technologies, problem solving, and interpretation of statistical measures, as well as the presence of concepts such as thought, literacy, and statistical reasoning. Topics such as special education, early childhood education, and history of statistics were rarely addressed.

Finally, Cristiane de Arimatéa Rocha and Antonio Carlos de Souza investigated the knowledge about the combinatorics of children in early childhood education and students of the initial years of elementary school. The authors analysed the research published in journals in the area of education in Brazil between 2010 and 2019 and identified eight studies on the subject. The combinatorial problems used in the research were analysed, emphasising different aspects, such as the order of magnitude adopted, the contexts evidenced, and the resources used to present the activities described. Brazilian research was found to be in line with research carried out in other countries and presents an advance in the sense of allowing the discussion of different types of combinatorial problems in the same study.

We invite the reader to browse through the articles and know the productions by this Brazil-Spain interaction in research in statistical education. At the same time, we thank the authors and especially the organisers of the I Spanish-Brazilian Seminar on Statistical Education, which generated fruitful academic debates and discussions that resulted in significant advances in research, many of which are represented in the articles selected here. We also thank the

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