

Paths and horizons of statistical education in civic education

Caminos y horizontes de la educación estadística en la formación ciudadana

Voies et horizons de l'éducation statistique dans la formation à la citoyenneté

Caminhos e horizontes da educação estatística na formação cidadã

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*"Statistics is the technology of the scientific method" (Rao, 1989)
— the tool that allows us to extract meaning from informational
chaos and transform it into structured knowledge.*

The ability to read, interpret, and critically analyze data is no longer the privilege of specialists or an isolated topic in the mathematics curriculum. It is, fundamentally, a prerequisite for the exercise of citizenship in a society deeply driven by data.

In this context of constant change, it is with great satisfaction and a sense of responsibility that we present this special issue dedicated to Statistics Education. The papers gathered here offer important reflections on teaching, learning, teacher training,

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and the role of statistics in K-12 and higher education, reaffirming its potential to promote critical thinking, evidence-based decision-making, and social participation.

To understand the progress made and the challenges ahead, it is necessary to recognize the historical trajectory of Statistics Education in Brazil. The consolidation of this field is closely linked to the creation of the Working Group on Statistics Education (GT12) of the Brazilian Society for Mathematics Education (SBEM), whose establishment responded to the need to establish a dedicated space for research. Although it shares foundations with mathematics, statistics has epistemological characteristics marked by variability, uncertainty, and the central role of context in the production and interpretation of data.

In this process of national strengthening, the holding of the Third Forum on Statistics Education represented an important milestone in the field's maturation. After two editions held in the Southeast Region, the event took place for the first time in the North Region, at the Federal University of Pará (UFPA) in Belém, under the coordination of the Study and Research Group on Statistics and Probability Education (GEDIM-STATISTIC), affiliated with the Institute of Mathematics and Science Education (IEMCI/UFPA). The choice of the Amazon as the host location symbolized not only the decentralization of GT12's activities but also recognition of the scientific output generated in the region and the need to broaden the dialogue among Brazil's diverse educational contexts.

The theme that guided the discussions at the Third Forum — "New Directions for Statistics Education: Empowerment, Citizenship, and Social Justice in the Age of Data" — summarizes the contemporary challenges in the field. The event brought together researchers, teachers, students, and professionals from across the country with the aim of strengthening the research groups affiliated with GT12 and reaffirming the role of statistical education in transforming local realities. By bringing this debate to the Amazon, the Forum highlighted that the democratization of scientific knowledge necessarily involves valuing regional experiences and incorporating diverse perspectives into the production of knowledge.

Historically, the teaching of statistics in schools has often been associated with the mechanical application of formulas and the formulaic construction of tables and

graphs. However, the papers presented in this issue demonstrate that contemporary statistical education goes beyond this instrumental view, adopting an investigative approach in which students formulate questions, collect data, analyze distributions, interpret results, and construct evidence-based arguments.

This approach fosters the development of statistical literacy, understood as the ability to understand, interpret, and critically evaluate data-based information. The goal is to educate citizens capable of recognizing biases in research, understanding the uncertainty inherent in the phenomena being analyzed, distinguishing correlation from causation, and using statistical information to inform decisions in various social contexts.

Thus, statistics ceases to be perceived as a set of technical procedures and becomes a language that enables students to interpret the world and understand social, economic, environmental, and scientific phenomena. When students analyze data related to the reality of their communities, estimate parameters, or make predictions based on concrete problems, learning becomes more meaningful and socially relevant.

For these investigative practices to take root in schools, it is essential to strengthen both initial and continuing teacher education. The collaboration between universities, federal institutes, schools, and research groups — such as GT12 — and their shared ideals represents a promising path for promoting innovative methodologies, the production of instructional materials, the development of technological resources, and collaborative research capable of enhancing the teaching of statistics at all educational levels.

As we look ahead to the future of statistics education in the coming years, it is clear that its relevance will continue to grow in light of the expansion of data science, artificial intelligence, and the increasing availability of digital information. In this context, the ability to formulate appropriate questions, interpret data with scientific rigor, and act ethically and critically is an essential competency for civic education.

As an academic community represented by GT12 and strengthened by regional initiatives such as GEDIM-STATISTIC, we reaffirm our commitment to building bridges between research, teaching, and outreach; between universities and K-12 education; between different regions of the country; and between scientific output and the concrete challenges facing society. Only in this way will it be possible to consolidate a

Statistics Education that effectively contributes to the intellectual, scientific, and social empowerment of Brazilian students.

We invite researchers, teachers, students, and all those interested in the field to explore this special issue. May the studies, experience reports, and reflections presented here inspire new research, strengthen innovative teaching practices, and broaden the horizons of statistical education as a tool for citizenship, social justice, and the transformation of reality.

We hope you all enjoy reading this issue.