

A proposal for popular statistical education on the Amazon: Gedim Statistic Goes to School

Una propuesta de educación estadística popular en la Amazonía: Gedim La Estadística va a la escuela

Une proposition d'un programme d'enseignement populaire des statistiques en Amazonie : Gedim Statistic Va à L'école

Uma proposta de educação estatística popular na Amazonia: Gedim Statistic Vai à escola

Vera Debora Maciel Vilhena¹

Universidade Federal do Pará

Mestre em Educação Matemática

<https://orcid.org/0000-0003-0247-0412>

Cassio Cristiano Giordano²

Universidade Federal do Rio Grande, Rio Grande

Doutor em Educação Matemática

<https://orcid.org/0000-0002-2017-1195>

Jacqueline Agnes da Silveira Santos³

Universidade Federal do Pará

Mestre em Educação Matemática

<https://orcid.org/0000-0003-3247-7770>

José Messildo Viana Nunes⁴

Universidade Federal do Pará

Doutor em Educação Matemática

<https://orcid.org/0000-0001-9492-4914>

Abstract

The implementation of Statistical Education in public schools constitutes one of the central goals of the outreach project "Gedim Goes to School", which is aimed at teachers and students in basic education within the municipal and state school systems of the state of Pará. The project is part of the activities of the Study Group on Statistical and Probabilistic Education at the Federal University of Pará (Gedim Statistic) and seeks

¹ vera.vilhena@icen.ufpa.br

² ccgiordano@furg.br

³ jacquelineasantos@gmail.com

⁴ messildo@ufpa.br

to promote the development of statistical literacy, grounded in the paradigm of questioning the world and in the guidelines of the National Common Core Curriculum (BNCC) (Brazil, 2018). In particular, it draws on the thematic unit Probability and Statistics, which guides the construction of school curricula in order to address the complexity of the skills and competencies to be developed. The group's actions prioritise the exploration of themes closely related to the everyday experiences of the participating community. Activities are developed through the collection, organisation, representation, and analysis of data, as well as through the proposal of interventions that contribute to the understanding and resolution of the investigated problem situations, culminating in informed decision-making processes. In this paper, we present the Gedim Statistic Goes to School project, as well as the development of the activities that comprise the portfolio of actions of this research group.

Keywords: Statistical education, Statistics teaching, Probability teaching, Basic education, National Common Core Curriculum

Resumen

La implementación de la Educación Estadística en las escuelas de la red pública constituye uno de los objetivos centrales del proyecto de extensión "Gedim va a la escuela", dirigido a la comunidad docente y estudiantil de la educación básica de las redes municipales y estatales del estado de Pará. El proyecto forma parte de las acciones del Grupo de Estudios en Educación Estadística y Probabilística de la Universidad Federal de Pará (Gedim Statistic) y tiene como objetivo promover el desarrollo del alfabetismo estadístico, fundamentándose en el paradigma del cuestionamiento del mundo y en las orientaciones de la Base Nacional Común Curricular (BNCC) (Brasil, 2018). En particular, toma como referencia la unidad temática Probabilidad y Estadística, que orienta la construcción de los currículos escolares, con el fin de contemplar la complejidad de las habilidades y competencias previstas. Las acciones del grupo priorizan el abordaje de temáticas próximas a la vida cotidiana de la comunidad participante del proyecto. Las actividades se desarrollan a partir de la recolección, organización, representación y análisis de datos, así como de la propuesta de intervenciones que contribuyan a la comprensión y resolución de las situaciones-problema investigadas, culminando en procesos de toma de decisiones informadas. En este trabajo presentamos el proyecto Gedim Statistic Va a la Escuela, así como el desarrollo de las actividades que integran el portafolio de acciones del referido grupo de investigación.

Palabras clave: Educación estadística, Enseñanza de la estadística, Enseñanza de la probabilidad, Educación básica, Base curricular común nacional.

Résumé

La mise en œuvre de l'éducation statistique dans les écoles publiques constitue l'un des objectifs centraux du projet d'extension « Gedim va à l'école », destiné à la communauté enseignante et étudiante de l'enseignement de base des réseaux municipaux et étatiques de l'État du Pará. Le projet s'inscrit dans les actions du Groupe d'Études en Éducation Statistique et Probabiliste de l'Université Fédérale du Pará (Gedim Statistic) et vise à promouvoir le développement de la littératie statistique, en s'appuyant sur le paradigme du questionnement du monde et sur les orientations de la Base Nationale Commune des Programmes (BNCC) (Brésil, 2018). En particulier, il prend pour référence l'unité thématique Probabilités et Statistiques, qui guide l'élaboration des curricula scolaires, afin de prendre en compte la complexité des compétences et des savoir-faire attendus. Les actions du groupe privilégient l'étude de thématiques étroitement liées au quotidien de la communauté participant au projet. Les activités sont développées à partir de la collecte, de l'organisation, de la représentation et de l'analyse de données, ainsi que de la proposition d'interventions contribuant à la compréhension et à la résolution des situations-problèmes étudiées, aboutissant à des processus de prise de décision éclairée. Dans ce travail, nous présentons le projet Gedim Statistic Va à l'École, ainsi que le développement des activités qui composent le portefeuille d'actions de ce groupe de recherche.

Mots-clés : Éducation statistique, Enseignement des statistiques, Enseignement des probabilités, Éducation de base, Base nationale commune curriculaire.

Resumo

A implementação da Educação Estatística nas escolas da rede pública constitui uma das metas centrais do projeto de extensão "Gedim vai à escola", voltado à comunidade docente e discente da educação básica das redes municipal e estadual do Estado do Pará. O projeto integra as ações do Grupo de Estudos em Educação Estatística e Probabilística da Universidade Federal do Pará (Gedim Statistic) e tem como objetivo promover o desenvolvimento do letramento estatístico, fundamentando-se no paradigma do questionamento do mundo e nas orientações da Base Nacional Comum Curricular – BNCC (Brasil, 2018). Em particular, toma como referência a unidade temática Probabilidade e Estatística, que orienta a construção dos currículos escolares,

de modo a contemplar a complexidade das habilidades e competências previstas. As ações do grupo privilegiam a abordagem de temáticas próximas ao cotidiano da comunidade participante do projeto. As atividades são desenvolvidas a partir do levantamento, organização, representação e análise de dados, bem como da proposição de intervenções que contribuam para a compreensão e a resolução das situações-problema investigadas, culminando em processos de tomada de decisão informada. Neste trabalho, apresentamos o projeto Gedim Statistic Vai à Escola, bem como o desenvolvimento das atividades que integram o portfólio de ações do referido grupo de pesquisa.

Palavras-chave: Educação estatística, Ensino de estatística, Ensino de probabilidade, Educação básica, Base nacional comum curricular.

Teacher training in statistics education and the creation of the Gedin Statistic Goes to School project

Introduction

Statistical Education in Brazil aims to investigate and understand how people teach and learn Statistics, encompassing cognitive and affective aspects of the teaching–learning process, the epistemology of statistical concepts, and the development of teaching methods and instructional materials, with a view to fostering statistical literacy. To this end, Statistical Education draws on theoretical and methodological resources from related fields such as Mathematics Education, Psychology, Pedagogy, Philosophy, Mathematics, and Statistics itself.

According to the *National Common Core Curriculum* (BNCC) (Brazil, 2018), uncertainty and data handling are addressed within the thematic unit *Probability and Statistics*. This unit proposes the study of concepts, facts, and procedures present in numerous problem situations drawn from everyday life, science, and technology. Consequently, all citizens are expected to develop skills to collect, organise, represent, interpret, and analyse data across a variety of contexts, enabling them to make well-founded judgements and informed decisions. This includes reasoning with and applying statistical concepts, representations, and indices to describe, explain, and predict phenomena.

Pre-service and in-service teachers are therefore encouraged to reflect on how to plan, design, and implement school-based activities that disseminate knowledge capable of fostering greater student engagement in learning tasks, while simultaneously enabling learners to take positions on social issues related to politics, economics, health, the environment, and other domains.

According to Gal (2002, p.10), for an individual to be considered statistically literate, it is necessary to demonstrate “familiarity with the basic terms and concepts related to graphical and tabular representations”. This entails the ability to interpret and critically evaluate statistical information, arguments based on research data, and stochastic phenomena encountered in diverse contexts, as well as to discuss or communicate one’s reactions to such information, including interpretations, opinions, and understandings of their meaning.

These abilities should not be treated in isolation, as they are interrelated and connected to a range of statistical knowledge and attitudes that need to be developed and valued by students. According to Gal (2002), in order to move beyond the

acquisition of technical knowledge, educators should foster attitudes of dialogue and discussion, valuing students' ideas and interpretations when they are confronted with real-world messages containing statistical elements and arguments. In this sense, Gal emphasises the importance of aligning course objectives with classroom activities and assessment practices, arguing that meaningful feedback and learning gains emerge only when such alignment is achieved.

Numerous challenges persist in the development of statistical literacy within basic education curricula. According to the BNCC, one key action for curriculum implementation involves "deciding on forms of interdisciplinary organisation of curriculum components and strengthening the pedagogical competence of school teams to adopt more dynamic, interactive, and collaborative strategies for the management of teaching and learning" (Brazil, 2018, p. 16). To address these challenges, the BNCC advocates the exploration of concepts, facts, and procedures embedded in real-life problem situations drawn from everyday contexts, science, and technology. Accordingly, all citizens must develop competencies related to data collection, organisation, representation, interpretation, and analysis in order to make sound judgements and appropriate decisions.

Pre-service teachers become aware that these curricular documents aim to guide their pedagogical practices and support the development of values that enable students to exercise their roles as citizens. While such guidelines are necessary, they are not sufficient for effective teaching practice. Therefore, the study of theoretical frameworks that support the design of coherent tasks with explicit educational purposes should be a central component of teacher education.

Legislative guidelines for Basic Education also highlight the importance of statistical knowledge in citizenship education. Consequently, teachers—particularly those working in the early years of schooling—must be prepared to contribute to the implementation of these recommendations. From this perspective, it is essential to provide students with opportunities to engage with diverse real-world problems and to choose their own strategies for solving them.

According to Teixeira, Nogueira, and Antunes (2022, p. 118), the "evolution of this way of teaching (and, consequently, of thinking and acting) is a dialectical process of questioning the world". As a result, in Didactics, the paradigm of visiting works has gradually been replaced by the paradigm of *questioning the world*, which encompasses and complements the former. This shift does not eliminate traditional content but rather expands and deepens it, as "there would be no didactic paradigm if there were nothing

to be learned". In this approach, the curriculum is no longer organised around doctrines and systems, but rather around questions posed by students and teachers, who jointly investigate them in search of answers.

Within this paradigm of questioning the world, Chevallard (2009) proposed a methodological framework known as the *Study and Research Path* (*Parcours d'Étude et de Recherche*). This didactic process begins with a generating question, which in turn gives rise to derived questions. Answers may be sought across a range of available media (books, treatises, the internet, newspapers, among others), with the aim of developing the initial question while maintaining focus on identifying the most appropriate response R to the generating question. This question lies at the core of the system and is inherently personal to each learner. In this context, fostering the development of elements of statistical literacy aims to support pre-service and in-service teachers in constructing critical pedagogical practices.

From this perspective, the *Study Group on Statistics and Probability* (Gedim/Statistic/UFGA) was established in 2019 with the purpose of contributing, through the use of methods and procedures from Statistical Science, to the development of an investigative, reflective, and critical stance among students at all educational levels, as well as among members of the local community. The group focuses on themes related to educational practices that promote statistical thinking, reasoning, and literacy, as described by Santos et al. (2022) in an article documenting the trajectory of the first research group in Statistical Education in the Brazilian Legal Amazon.

According to Cruz and Portella (2021), the Brazilian Legal Amazon is currently experiencing a demographic dividend, a situation in which the working-age population exceeds the number of retirees and children. Under ideal conditions, this demographic dividend can contribute to wealth generation and development. However, the authors emphasise that its benefits fundamentally depend on the provision of accessible, high-quality education capable of preparing the working-age population to participate effectively in the productive sectors of the Amazonian economy.

In 2025, the city of Belém will host the 30th United Nations Climate Change Conference (COP 30), with the aim of debating and understanding climate change in the context of the data era, citizenship, and social justice through Statistical Education. A statistically educated society, aware of the implications of data-informed decision-making, may contribute to increased engagement in combating the global climate crisis. In this sense, Statistical Education emerges as a powerful ally in achieving global

sustainability goals and fostering a culture of environmental preservation and global responsibility.

Against this backdrop, with the resumption of in-person activities at the Federal University of Pará (UFPA) in 2023, the leadership of the Gedim Statistic group proposed the development of an outreach study entitled *Gedim Statistic Goes to School*.

The initial meetings involved the study of official curriculum-regulating documents, as well as scientific literature (journal articles, theses, and dissertations) that informed propositions related to the project's thematic focus. Subsequently, textbooks used in the early years of schooling were analysed to examine how statistical literacy is addressed in these materials. The development of the project proposals required engagement with several theoretical frameworks, including Statistical Literacy (Gal, 2002), Statistical Thinking (Wild & Pfannkuch, 1999), Statistical Reasoning (Garfield & Gal, 1999), the Theory of Didactical Situations (Brousseau, 1996), and the Anthropological Theory of the Didactic (Chevallard, 1997, 1999, 2001).

Project Objectives

General Objective

To promote the teaching and learning of Statistical Education among pre-service and in-service teachers, as well as among students at all educational levels, with an emphasis on the development of the three core competencies in statistics education—Statistical Literacy, Statistical Thinking, and Statistical Reasoning—grounded in the *paradigm of questioning the world* and in the *Anthropological Theory of the Didactic* (ATD).

Specific objectives

- To identify and discuss the potential of themes appropriate to the target audience, taking into account the sociocultural context of the participating community;
- To analyse textbooks in order to examine how statistical literacy, statistical thinking, and statistical reasoning are addressed within educational contexts;
- To design workshops aligned with the selected themes;
- To implement the planned workshops;
- To analyse the productions developed during the workshops;
- To develop instructional materials as educational products for both pre-service and in-service teachers, based on the analyses conducted;

- To present didactic portfolios aimed at fostering the teaching and learning of Statistical Education.

Methodological procedures

O The project work plan comprises the reading and discussion of relevant texts, lectures, and field-based and dialogical research activities, as well as debates that value participants' experiential accounts. It also includes the analysis of teaching materials with both teachers and students, ranging from the use of concrete, manipulable resources to the integration of digital technologies, with the aim of promoting multiliteracy through critical questioning of the world. The work plan is structured into three stages: planning, implementation, and evaluation of the workshops.

Stage 1: Planning

At this stage, thematic topics are selected according to the target audience, which includes students and teachers from municipal and state schools, as well as from the State and Federal Universities of Pará. Regional themes are chosen in accordance with appropriate statistical objects in order to foster discussion among workshop participants.

Stage 2: Implementation of the Workshops

The implementation takes place in municipal and state schools in Pará, as well as at the State University of Pará, the Federal University of Pará, and the Federal Institute of Pará, through the organisation of workshops, short courses, panels, and lectures. The execution of these activities depends directly on financial support, a necessity justified by the format of the workshops, which are conducted in situ at the request of the interested institutions, and by the need to renew materials for each session. In general, stationery materials such as rulers, marker pens, paper, and similar items are used.

Stage 3: Evaluation of the Workshops

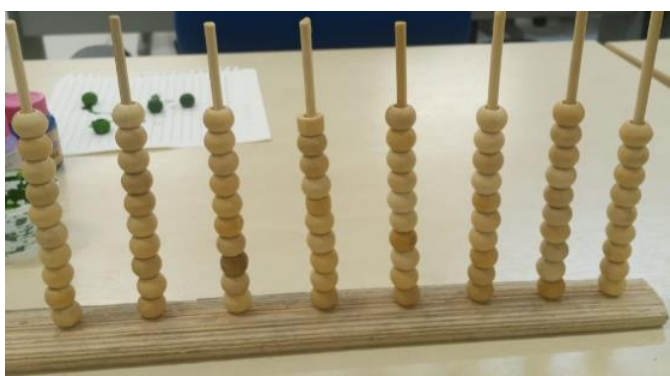
Formative assessment is adopted in this stage, with an emphasis on understanding the cognitive processes employed by students. When qualitatively analysed and interpreted, these processes provide insights into learning development and teaching practice. There is a clear concern with contextualising teaching, learning, and assessment processes. Negotiation and didactic contracts established with students create favourable conditions for the development of self-assessment and self-regulation of learning. For formative assessment to be effective, it is necessary to carefully select

tasks that promote interaction, relationships, and the meaningful mobilisation of different types of knowledge, thereby possessing high educational and formative value (Perrenoud, 1999).

The evaluation of the workshops is carried out through printed or online questionnaires and through the analysis of the activities produced by participants, as well as through the research group's observations regarding the development of the workshops. These procedures highlight both the limitations and the potential of the activities, with a view to improving the teaching and learning processes in Statistical Education. During the workshops, participants represent data using regionally contextualised concrete materials produced by members of the Gedim Statistics Group, as shown in Figure 1.

Figure 1.

Regional concrete material made by the group with recyclable material: Açaí cart, miriti, barbecue stick.



Source: Gedim Statistic Collection (2024).

Other materials used in the activities are the Quadrográfico material (Figure 2), and the Recycled Material Table (Figures 2 and 3).

Figures 2 and 3.

Teaching Material: Tabletop Chart and Recyclable Material Table.

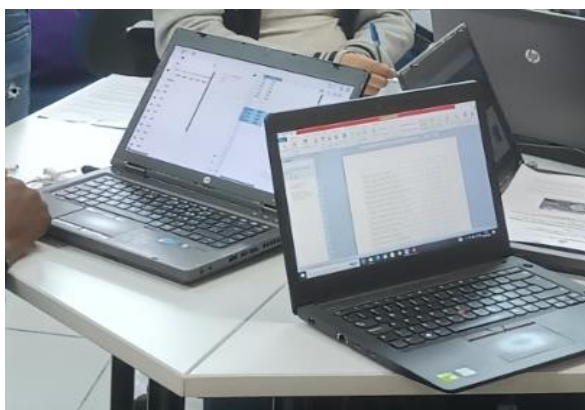


Source: Gedim Statistic Collection (2024).

We also used the computer as a teaching tool for data analysis (Figure 4).

Figure 4.

Technological Teaching Material.



Source: Gedim Statistic Collection (2024).

Working with appropriate didactic materials, ranging from concrete to technological resources, in Statistical Education activities can enhance teaching and learning processes related to the organisation and representation of data in graphs and tables.

According to Paviani and Fontana (2009, p. 78), didactic materials, when used as classroom teaching resources, are recommended as concrete, experience-based activities, typically developed through the dynamics of pedagogical workshops. For these authors, a workshop is a way of constructing knowledge, with an emphasis on action, without losing sight of the theoretical foundation”, and its purposes include “the articulation of concepts, assumptions, and notions with concrete actions experienced by participants or learners, as well as the experience and execution of collaborative tasks, that is, the appropriation or collective construction of knowledge.

In line with these perspectives, the Gedim Statistic Group conducts its workshops using didactic materials that range from concrete to technological resources, which serve to articulate theory and practice in the teaching of Statistics and facilitate the practical representation and analysis of data. The following section presents the activities carried out within the project *Gedim Statistic Goes to School*.

Activities of the Gedim Statistic Group

With the aim of promoting the teaching of Statistics within the educational community — encompassing schools and universities—and targeting teachers in initial and continuing education, as well as basic education students, twelve workshops were conducted in 2023 (Table 1). These workshops addressed topics related to questioning the world as a pedagogical approach to Statistical Education and included Modules I and II of the course *Implicative Statistical Analysis*, taught by Professor Dr Saddo Ag Almouloud.

Table 1.

Cycle of Workshops and Courses promoted by Gedim Statistic

WORKSHOPS AND COURSES	ORGANIZERS
Workshop for Undergraduate Students: Basic Statistics Concepts Using Concrete Materials in Initial Teacher Training	Gedim Statistic
Workshop during Freshman Week: Basic Statistics Concepts in Basic Education using Concrete Materials	
Workshop at the Planetarium: Learning Statistics in a dynamic and thoughtful way - from the use of concrete materials to technology.	
Workshop: Fun Statistics at the Science Club	
Workshop at Souza Franco School: Statistics in Basic Education using Concrete Materials	
Workshop on Statistical Education in Initial Teacher Training	
Extension course in continuing teacher education.	
Undergraduate Workshop: Basic Statistics Concepts in Basic Education using concrete materials and technology.	
Course: Basic Statistics in Mathematical Modeling	Debora Vilhena, Ady Wallace; Support: Matheus, João Victor and Maykom
Course: Implicative Statistical Analysis – ASI (I and II)	Saddo Ag Almouloud
Workshop: Basic Statistics Concepts Using Concrete Materials Through Questioning the World	Debora Vilhena
Oficina: Noções de Estatística com uso de material concreto	Debora Vilhena and Silvia Pena

Source: Gedim Statistic.

All activities carried out in 2023 are detailed in the book chapter *Gedim Statistic: Successful Experience of the Study and Research Group in Mathematics Didactics*, published in 2024 by Akademy Press. The project remains ongoing at the time of writing, and further activities and results will be presented in subsequent sections of this work.

Between 2024 and 2025, the Gedim Statistic Group promoted extension courses, academic presentations, publications, research projects, events, and lectures, with the participation of teachers and/or researchers in the field of Statistical Education, as outlined in Table 2.

Table 2.

Activities during the Gedim Statistic Goes to School Project, years 2024 to 2025

GEDIM STATISTICS GROUP ACTIVITIES	ORGANIZERS/GUESTS
Extension Course: Item Response Theory	Gedim Statistic Group and. Héliton Tavares
Gedim Statistic Project Goes to School: 1st Workshop with IEMCI/UFPA Freshmen of 2024	Gedim Statistic Group
Bora Lá Project: Workshop with Teachers from the Municipality of Bragança - Training for over 300 teachers	Gemaz Group and Gedim Statistic Group
Bora Lá Project: Lecture by Prof. Dr. Carlos Mathias at Benvinda School, Belém/Pará	Gemaz Group e Gedim Statistic Group
Bora Lá Project: Partnership with SEMEC Belém-Pará	Gemaz Group e Gedim Statistic Group
Statistics Tent at UFPA - We served over 1000 people at the booth, and 876 hands were measured.	Gedim Statistic Group and Dóris Fontes (Coren3 Advisor)
Gedim Statistic Project Goes to School Workshop: At the 76th SBPC Jovem event at UFPA	Gedim Statistic Group
Gedim Statistic Project Goes to School Dom Pedro I School - Belém/PA	Gedim Statistic Group
Gedim Statistics Project Goes to School - Workshop: Integrated Degree Students. Institute of Mathematical and Scientific Education – IEMCI/UFPA	Gedim Statistic Group
Gedim Statistic Project Goes to School - Rural University of the Amazon – UFRA – Belém/PA	Gedim Statistic Group

Source: Gedim Statistic.

This paper will showcase some of the activities carried out during the Project from March 2024 to March 2025.

Results

Extension Course

The extension courses promoted by the *Gedim Statistic Goes to School* project constituted structured moments of study that enabled both the learning and the deepening of topics related to Statistical Education. These initiatives also contributed to the creation of the group's channel on one of the world's largest video-sharing platforms, which, among other benefits, provided an opportunity to disseminate the knowledge produced by the group to a broader online audience interested in the themes addressed.

One of the extension courses offered by the project took place in March 2024 and focused on *Item Response Theory (IRT)*. The course was delivered by Professor Dr Héli-ton Tavares from the Federal University of Pará (UFPA). Its main objective was to present the potential and applications of IRT across different fields of knowledge, with particular emphasis on Education, given that several large-scale assessments in Brazil are based on this theoretical framework, such as the *Exame Nacional do Ensino Médio (ENEM)*, the *Exame Nacional de Desempenho de Estudantes (ENADE)*, and the *Sistema de Avaliação da Educação Básica (SAEB)*.

Figure 5.

Card for the TRI Extension Course – 2024.



Source: *Gedim Statistic Archive*.

The course was attended by teachers from municipal and state basic education systems, researchers in the fields of Statistics, Statistical Education, Mathematics Education, Pedagogy, and related areas, as well as pre-service teacher education students and other participants interested in the topic. At the conclusion of the course, dozens of certificates were issued to participants.

Other project activities

In addition to the extension courses, the *Gedim Statistic* group designed and implemented several other activities between 2024 and March 2025. These initiatives aimed to promote and strengthen work in Statistical Education and are part of the project *Gedim Statistic Goes to School*.

Workshop with teachers from the municipality of Bragança – partnership with the “bora lá” project

With a focus on the professional development of primary education teachers, the *Group of Studies and Research in Mathematics Education and Amazonian Culture* (Gemaz) and the *Research and Study Group in Statistical and Probabilistic Education* (Gedim Statistic) continued the activities of the extension project “*Bora Lá: Mathematics Education for Teachers and Students in the Early Years*”. On 4 and 5 April 2024, in partnership with the Municipal Department of Education of Bragança, project members participated in the second stage of the 2024 Pedagogical Journey. During this event, workshops focused on Mathematics and Statistics were conducted at the *Escola Municipal Professora Júlia Quadro Peinado*, reaching the professional development of more than 300 teachers.

Figure 6.

The working group in Bragança-PA.



Source: Gedim Statistic Archive (2024).

With this proposal, *Gemaz* and *Gedim Statistic* reinforce the extension-oriented mission of the community of the *Institute of Mathematical and Scientific Education* (IEMCI) at the *Federal University of Pará* (UFPA), which has consistently prioritised quality in teacher education and professional learning.

During the programme, six workshops were offered to sixteen groups of in-service teachers working in schools located both in rural areas and in the urban centre of the municipality. The workshops addressed themes such as game design, the use of contextualised teaching materials, investigative approaches, and digital resources as key allies in teaching, learning, and assessment processes. These proposals were discussed and implemented by 367 teachers from 100 schools in the municipality of Bragança, working with students from the 1st to the 5th grades of primary education.

Among these participants, 190 teachers were assigned to 81 schools located in rural areas, while 177 teachers worked in schools situated in the urban area of Bragança.

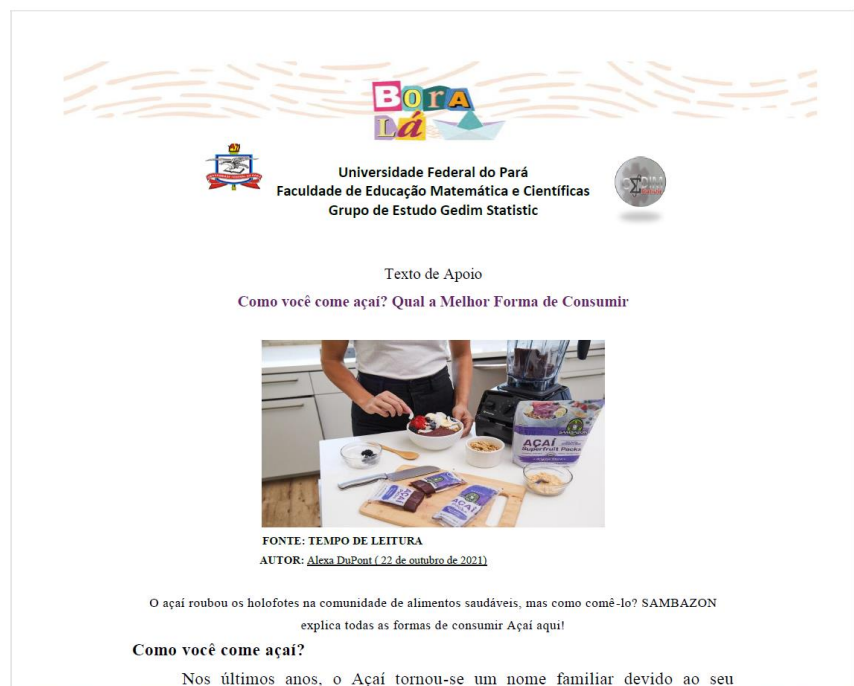
The presence of the project at the event enabled dialogue with teachers from schools located more than 60 kilometres from the urban centre, thus ensuring the project's commitment to reaching far beyond the physical boundaries of the university.

The workshop on *Statistical Education* focused on the theme *Notions of Statistics and Bioeconomy through the Use of Concrete Materials*. The supporting text for the activity was "How Do You Consume Açaí? What Is the Best Way to Consume It?" (Figure 7). Participants were divided into five groups and began the activity by reading and discussing the text. For data collection, they answered questions related to the text, organised and represented the data using concrete didactic materials, and subsequently presented their results (Figure 8).

During the discussions following the presentations, participating teachers proposed solutions to several issues identified in the activity. One of the central concerns was the high price of açaí during the period in which the workshops were conducted in the Bragança region of the state of Pará. Among the solutions suggested by the teachers was the possibility of cultivating açaí trees in their own backyards, a practice facilitated by local customs and regional cultural traditions.

Figure 7.

Workshop Supporting Text.

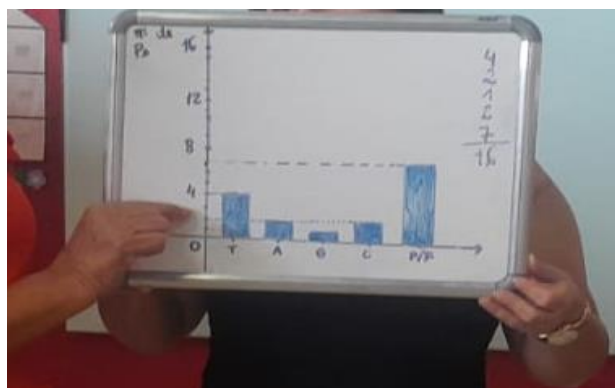


Source: Gedim Statistic Production (2024).

Five groups from continuing teacher education programmes in the Bragantina region of the state of Pará participated in the study, comprising a total of 130 participants. Figure 8 presents the results obtained from Group 2 (G2), which addressed the question: "What types of food do you consume with açaí?"

Figure 8.

Results of the G2 Bragança workshop survey.



Source: Gedim Statistic Archive (2024)

During the presentations, discussions focused on the participants' understanding of the research process and the difficulties encountered while conducting the investigation. The teachers recognised the importance of addressing Statistics from the early years of schooling, particularly when grounded in students' social and cultural contexts, as this approach enhances learners' motivation and facilitates a deeper understanding of the phenomena under investigation. At the conclusion of the activities, the teachers completed an evaluation of the workshop, the results of which are presented in Table 3.

Table 3.

Statements from teachers who participated in workshops in Bragança/PA

PARTICIPANT	TESTIMONIAL
P1	<i>I loved the way the subject was approached, and how much we can apply it with our students. And I believe it was a topic that will allow us to develop a range of research and enhance our knowledge.</i>
P2	<i>More workshops like this one that share accessible knowledge.</i>
P3	<i>These workshops should be held more frequently.</i>
P4	<i>The way the text about açaí was explored.</i>
P5	<i>The use of recycled materials</i>
P6	<i>The importance of Statistics</i>
P6	<i>We need more in-depth workshops on the topics covered.</i>

Source: Teachers participating in the Workshops in Bragança/PA, 2024.

According to the *Base Nacional Comum Curricular* (BNCC), one of its competencies that extends beyond general education is to:

Consider local realities, the expectations of the school community, and the physical, material, and human resources of school systems and institutions, in order to provide students with effective opportunities to construct and develop their life projects and to integrate consciously and autonomously into civic life and the world of work. To this end, educational pathways should promote the appropriation of cognitive procedures and the use of methodologies that foster youth protagonism (Brasil, 2018, p. 478).

In this sense, the *Gedim Statistic* project contributes to the development of the competencies outlined in the BNCC through Statistical Education, employing problem-solving approaches and data analysis to foster statistical thinking, reasoning, and literacy—skills that are essential for understanding and engaging with life beyond the classroom.

The statistics tent at the 76th annual meeting of the SBPC⁵ at UFPA

The *Statistics Tent* offers interactive activities and curiosities aimed at teaching basic statistical concepts and highlighting the importance of data analysis for the exercise of citizenship. The initiative is coordinated by Ms Doris Fontes, a councillor of the Regional Council of Statistics of the 3rd Region (CONRE 3). This edition of the *Statistics Tent* was supported by undergraduate students and faculty members from the Statistics programme at the Federal University of Pará (UFPA), as well as from the integrated teacher education programme of the Institute of Mathematical and Scientific Education (IEMCI/UFPA), including Professor Débora Vilhena, who holds a degree in Statistics and serves as Vice-Coordinator of *Gedim Statistic*.

According to Professor Vilhena, the event “yielded positive results, as Statistics taught in schools appears to be increasingly disconnected from people’s everyday lives, and the activities developed in the Tent can help bridge this gap.” Among the activities offered, the measurement of participants’ right-hand palm size resulted in a total of 876 measurements, comprising 471 women and 405 men.

Figure 9

Activities at the Statistics Tent.

⁵ The SBPC Annual Meetings have been held since 1949, with the participation of representatives from scientific societies, authorities, and managers of the national science and technology system. The event aims to disseminate scientific advances in various fields of knowledge to the entire population and to discuss public policies in the areas of Science, Technology, Innovation, and Education.



Source: Gedim Collection

Table 4 contains some testimonials from Gedim Statistic members regarding people's participation in the Statistics Tent at the 76th SBPC.

Table 4

Testimonials from Gedim Statistic members, 2024.

PARTICIPANT	TESTIMONIAL
D1	<i>At first, people were surprised by the simplicity of the activities and then happy to understand something that had previously seemed difficult to them, realizing connections to everyday activities.</i>
D2	<i>They were thrilled by the hand span measurement, as they observed the normal curve they study in books materialize through the information collected from the visitors.</i>
D3	<i>The first time they tried playing the games, they were intrigued by the results.</i>
D4	<i>After a discussion between the presenters about the topic and the objectives of the games, the participants were pleased to have understood the concepts of probability and statistics in a relaxed way.</i>
D5	<i>The statistics taught in school seem to be increasingly detached from people's daily lives. This is the perception gained from the accounts of various visitors who observed the impact statistics has on everyday actions.</i>
D6	<i>I believe that these activities can be used and applied in Basic Education, without much cost, and with excellent teaching and learning outcomes in Statistics and Probability, he states.</i>
D7	<i>Even professionals who have already taken an introductory statistics course are surprised by the simple way statistical concepts are presented at the Statistics Tent. The surprise stems from the manner in which the subject is approached in the classroom.</i>
D8	<i>The participants were pleased because they easily understood the concepts covered, which, in significant part, are approached in a technical way in the classroom, for example, without playfulness. I received reports from teachers who said they were unaware of this connection between theory and practice, and when they made this association, understanding the concepts became easier, he explains.</i>

Source: Gedim Statistic Members, 2024

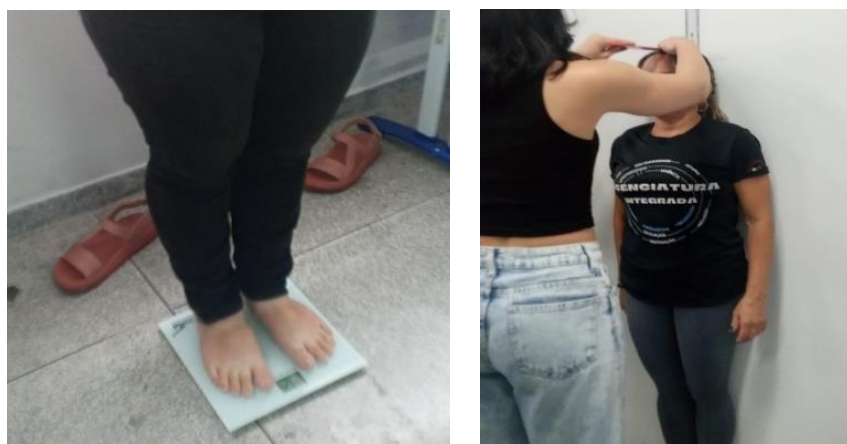
We intend to expand the project's coverage to a larger number of schools across the state of Pará and to incorporate into our set of activities those previously developed within the *Statistics Tent* initiative.

Workshop in the integrated teaching degree programme

In the workshop conducted with undergraduate students enrolled in the Integrated Teaching Degree Programme at IEMCI/UFPA, members of the *Gedim Statistic* group addressed the topics of Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR). During the activity, students engaged with written texts, expressed their opinions on the subject, and carried out field research involving the collection of measurements required for the calculation of these indices. Students participating in the WHR and BMI data collection process are shown in Figure 10.

Figure 10.

Measurement of weight and height of undergraduate students from the UFPA Teaching Degree Programme.

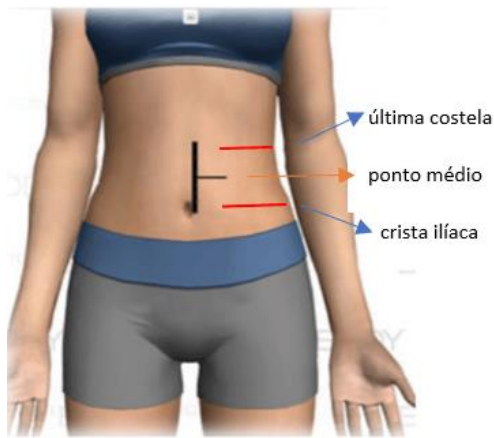


Source: Gedim/Statistic Archive, 2025

To calculate the waist-to-hip ratio, students divided the waist circumference—measured at the midpoint between the last rib and the iliac crest—by the hip circumference, both obtained using a measuring tape. According to the World Health Organization, WHR values vary by sex and age and should not exceed 0.85 for women and 0.90 for men. Values equal to or above these thresholds indicate a high risk of cardiovascular diseases. The waist-to-hip ratio (WHR) is therefore used as an indicator to estimate an individual's risk of developing cardiovascular conditions.

Figure 11.

Representation of the WHR calculation.



Source: <http://www.google.com.br>. WHR reference link: WHR: <https://nutritotal.com.br/publico-geral/material/rcq-calcul-o-seu-risco-de-ter-doencas-cronicas/>

The Body Mass Index (BMI), in turn, is calculated as the ratio between an individual's weight and the square of their height, as illustrated in Figure 12.

Figure 12.

Body Mass Index (BMI) formula.

$$\text{BMI Formula} = \frac{\text{Weight}}{\text{Height}^2}$$

Source: <http://www.google.com.br>

Workshop Activity Procedures

The workshop activities were designed to address the following objectives: to explore the sample space of students' measurements; to introduce concepts of combinatorial analysis; to examine measures of central tendency (mode, mean, and median); to calculate Body Mass Index (BMI); and to present the results using concrete materials.

During data collection, each group gathered the following information from participants: body mass, height, waist circumference, and hip circumference, using a measuring tape and a digital scale. Based on the collected data, the groups calculated the mean, mode, and median of the samples formed from the participants' BMI and Waist-to-Hip Ratio (WHR) values.

Students recognised the importance of organising the collected data and applying measures of central tendency in the construction of a coherent statistical analysis. The

implement creative and effective approaches to the teaching of Mathematics and Statistics.

Regarding future perspectives, the *Gedim Statistic* group intends to extend its activities to additional municipalities within the Metropolitan Region of Belém, with the aim of reaching a greater number of schools and incorporating new actions that further strengthen the development of statistical literacy and community participation. We believe that the continuation of this work will contribute to the education of more critical and reflective citizens who can interpret and transform the reality around them.

Acknowledgements

We would like to express our gratitude to all those who contributed to the implementation of the *Gedim Statistic Goes to School* project.

References

- Brasil. (2018). *Base Nacional Comum Curricular: Educação é a base*. Ministério da Educação; CONSED; UNDIME.
- Brousseau, G. (1996). *La théorie des situations didactiques* [Curso de Montréal]. Disponível em <http://www.guy-brousseau.com> (Acesso em 7 de setembro de 2023).
- Chevallard, Y. (1997). Familière et problématique, la figure du professeur. *Recherches en Didactique des Mathématiques*, 17, 17–54.
- Chevallard, Y. (1999). L'analyse des pratiques enseignantes en théorie anthropologique du didactique. *Recherches en Didactique des Mathématiques*, 19(2), 221–266.
- Chevallard, Y. (2001). *Aspectos problemáticos de la formación docente*. In XVI Jornadas del SI-IDM. Huesca. Disponível em <http://www.ugr.es/local/jgodino/siidm.htm> (Acesso em 17 de abril de 2025).
- Chevallard, Y. (2009). *La notion de PER: Problèmes et avancées*. UMR ADEF.
- Cruz, T., & Portella, J. (2021). *A educação na Amazônia Legal: Diagnóstico e pontos críticos*. Disponível em <https://amazonia2030.org.br/educacao-na-amazonia-legal/> (Acesso em 17 de abril de 2025).
- Gal, I. (2002). Adults' statistical literacy: Meanings, components, responsibilities. *International Statistical Review*, 70(1), 1–25. <https://doi.org/10.1111/j.1751-5823.2002.tb00336.x>
- Garfield, J., & Gal, I. (1999). Teaching and assessing statistical reasoning. In L. V. Stiff & F. R. Curcio (Eds.), *Developing mathematical reasoning in grades K–12* (pp. 207–219). National Council of Teachers of Mathematics.
- Paviani, N. M. S., & Fontana, N. M. (2009). Oficinas pedagógicas: Relato de uma experiência. *Conjectura*, 14(maio–agosto).
- Perrenoud, P. (1999). Construir competências é virar as costas aos saberes. *Revista Pátio*, 3, 15–19.

- Santos, J. A. S., Vilhena, V. D. M., & Pena, S. C. S. (2022). A trajetória pioneira do Gedim Statistic na difusão da Educação Estatística. *Revista Baiana de Educação Matemática*, 3(1), 1–18.
- Teixeira, B. F., Nogueira, C. M. I., & Antunes, F. C. A. (2022). A mobilização das dialéticas na promoção da aprendizagem por meio do Percurso de Estudo e Pesquisa (PEP). In S. A. Almouloud, R. B. Guerra, L. M. S. Farias, A. Herinques, & J. M. V. Nunes (Orgs.), *Percursos de estudo e pesquisa à luz da Teoria Antropológica do Didático* (Vol. 1, pp. 1–466). Editora CRV.
- Vilhena, V. D. M., Nunes, J. M. V., Santos, J. A. S., Giordano, C. C., & Lima, R. F. A. (2024). A trajetória do Grupo Gedim Statistic no âmbito da Educação Estatística. In A. C. Souza, C. E. F. Monteiro, C. C. Giordano, C. A. Rocha, I. M. Cazorla, & M. C. Utsumi (Orgs.), *Panorama dos grupos de pesquisa em Educação Estatística no Brasil: Desafios, avanços e perspectivas para os próximos anos*. Akademy.
- Wild, C. J., & Pfannkuch, M. (1999). Statistical thinking in empirical enquiry. *International Statistical Review*, 67(3), 223–265. <https://doi.org/10.1111/j.1751-5823.1999.tb00442.x>