

A teaching experience with the simple linear correlation model in lower secondary education

María de Lourdes Santana Salinas ¹ 

Ricardo Quintero Zazueta ² 

Addressed problem

The issue addressed in this study is the delay in the development of stochastic thinking among lower secondary school students. It has been documented that topics related to probability and statistics are often relegated because basic education teachers struggle to understand these subjects and are not adequately prepared to teach them (Yang & Sianturi, 2019). Recent research highlights the growing importance of statistical literacy for developing skills that enable students to critically evaluate data and consider uncertainty in decision-making (Büscher, 2022).

Approach

A classroom intervention was conducted in a public secondary school in Mexico City. The research context involved adolescents from areas with social challenges. The innovation of this study was the design of an Educational Research Workshop aimed at teaching a simplified version of the linear correlation model to support data analysis and the development of

¹ lourdes.santana@cinvestav.mx

Centro de Investigación y de Estudios Avanzados del IPN, Mexico City, Mexico

² quintero@cinvestav.mx

Centro de Investigación y de Estudios Avanzados del IPN, Mexico City, Mexico

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an informed intuition for decision-making. The workshop focused on teaching and applying stochastic tools to foster an educated intuition (Fischbein et al., 1971). According to Heitele (1975), training stochastic intuitions prior to acquiring analytical knowledge is considered more urgent in stochastics than in other areas.

Implementation

The workshop was implemented with ninth-grade students because, during the transition from lower secondary to upper secondary education in Mexico, a high percentage of adolescents choose not to continue their studies. In the 2016–2017 school year, the dropout rate was 5.3% in lower secondary education and 15.2% in upper secondary education (Instituto Nacional para la Evaluación de la Educación [INEE], 2019).

This innovation, termed the “Educational Research Workshop,” was structured into four stages for teaching a simplified version of the linear correlation model. The simplification consisted of providing the standard deviation of the variables as given data. This simplification, along with the design of the workshop materials, was based on one of Bruner’s (1960) proposals for improving education: facilitating the learning of a lesson through an appropriate representation that supports intuitive understanding and fosters the transition to a higher cognitive level for more complete analytical learning. Heitele refers to this perspective as Bruner’s “principle of prefiguration” (Heitele, 1975, p. 187).

In the first stage of the workshop, students explored stochastic thinking by identifying terms indicating the random or deterministic nature of events in news texts. They also carried out random experiments—such as dice rolls and drawing balls from an urn with replacement—to reason about all possible outcomes of a random event, calculate their probabilities, and list the corresponding sample space. In the second stage, students analyzed statistical information presented in graphs and worked with scatter plots and lines of best fit to examine data trends and estimate values of statistical variables when one variable changes. Active teaching took place in the third stage, in which students collected experimental data for four variables. They then organized the data into tables, constructed scatter plots, and traced the line of best fit. To transition from paper-and-pencil work to the use of technology for data processing and computation of the correlation coefficient, the final stage involved activities using GeoGebra and Excel. Beginning with manual data collection, organization, representation, and processing was intended to promote critical thinking about information handling throughout the analysis process.

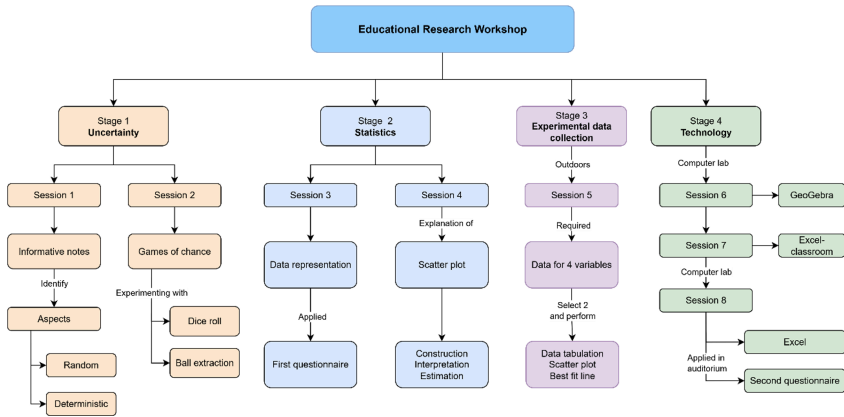
A distinctive feature of the workshop design was the inclusion of activities related to the students’ context. This decision was based on

research showing that contextually relevant situations can improve students' understanding of mathematical concepts (Yang & Sianturi, 2019).

Figure 1 shows the structure of the workshop and the content of its eight sessions:

Figure 1

Organization of the Educational Research Workshop



Importance and Potential Significance

One way to address the lack of teacher preparation for teaching stochastic topics is to provide them with structured materials that can serve as models for classroom use. Integrating data analysis with GeoGebra and Excel underscored the significance of the correlation coefficient for fostering intuition related to quantifying the relationship between two variables. Based on observations during the workshop, the most intuitively meaningful element for students was the scatter plot, which encouraged reflection on data trends between two variables and their potential relationship.

An aspect to improve in the workshop design would be the inclusion of semi-structured interviews with students to better understand and assess their willingness to apply probability and statistics tools, as well as the development of intuition in decision-making.

Two factors that did not work well during implementation were students' lack of interest in probability and statistics topics and the physical constraints of the classroom. The arrangement of furniture should be planned more carefully to encourage social interaction.

This teaching experience allowed students to appreciate data collection from a critical standpoint, questioning the reliability and accuracy of results. Working with the linear correlation model motivated them to analyze

relationships between variables and to formulate preliminary inferences when estimating variable behavior using the tools presented in the workshop to define a course of action.

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