THE EMERGENCE OF STATISTICAL REASONING IN BRAZILIAN SCHOOL CHILDREN

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This paper presents the partial results of a study conducted in the fourth grade in a Brazilian school. The study aims to verify if young children are aware of probabilistic and combinatorics thinking. The emergence of statistical teaching for K-8 students in Brazil is very recent. Santa Ursula University (Rio de Janeiro, Brazil) and Rutgers University (New Jersey, USA) as part of an agreement for technical scientific cooperation to develop research in this field.

INTRODUCTION AND BACKGROUND OF THE STUDY

The emergence of statistical teaching for K-8 students in Brazil is very recent. The introduction of statistics as a mathematical topic in the initial teaching years was being done in non-systematic experiences for five years. Later in 1997, after some experiences were developed in schools of the states of Minas Gerais, Sao Paolo, and Rio de Janeiro, these notions were integrated into the curriculum planning. Some of the textbooks published in the past two years introduced statistical ideas. In 1997, the Ministerio de Educação e Cultura - MEC - published the “Parâmetros Curriculares Nacionais” document (Nation Curriculum Parameter) in which the introduction of statistics became a required part of the national curriculum. This was due to the social demand to emphasize the importance of statistics to society. The aim was related to the student capacity of construction, data collection, organization, communication, and data interpretation using tables, graphs, and other kinds of representations.

In 1996, Santa Ursula University, in its graduate course in mathematical education (masters degree) developed an agreement for scientific cooperation with Rutgers University. The goal of the agreement was to develop research in mathematics education. In February 1997, it was decided that statistical activities would be developed in schools in the USA, Brazil, and Israel, as a component of a collaborative cross-cultural research program.

METHOD

In Brazil, these activities were applied in a catholic urban school in Rio de Janeiro. We worked with eight students, two fourth graders, two fifth graders, two sixth graders, and two seventh graders. The students worked in pairs. In the first semester, we discussed the planned activities and tried to find students who were interested in participating in the research. We explored two activities with each pair of students. The students began making their first conjectures about the tasks and discussed their ideas.

Data was collected for this study using videotape and audio tape of interactions during pair engagement working on both tasks. We also used a collection of students' written work and researchers' notes.

RESULTS AND DISCUSSION

The data analysis started with the researchers' group viewing of videotapes and transcription. We started with two fourth grade students, Carolina and Rodrigo. We believe that the results of this study will contribute to the research of students' probabilistic/statistical thinking. We will continue analyzing the data that we collected.

*Investigation #1***.** The game is played by two players and involves rolling one die. Player A gets a point if 1, 2, 3, or 4 occurs; Player B gets a point if 5 or 6 occurs. The first player to get to 10 points is the winner.
Is the game fair? Why? or Why not?
Play the Game with a partner (You can play several games if you need to.)
Do the results of playing the game support your answer to the question above? Explain.
If you think that the game is unfair, how could you change it so that it will be fair?

The meeting started with the description of the game rules. Player A was called Antonio and Player B was Pedro. At first the researcher rolled the die and the students chose the winner. Students used a table to tally wins. When the researcher asked if the game is fair, both perceived that the game was not fair and gave explanations.

Researcher: Who do you think will always be the winner?
Carolina: Antonio, because he has more chances and more numbers.
Rodrigo: Antonio, because he has more numbers to win.

STUDENTS' NOTATION

ANTONIO I I I I I I I I I I PEDRO I I I

Students were then asked to choose one of the roles in the game. Rodrigo took the role of Antonio and Carolina was Pedro. They played the game to in order to verify if their guess of Antonio being the winner was correct. Carolina rolled the die and showed a 6. One point for Pedro. Rodrigo rolled a 4. One point for Antonio. And so on. At the end of thirteen plays Rodrigo scored 10 points and Carolina 3 points. Antonio was the winner. After some games, it was verified that Antonio always wins. They confirmed the guess. Carolina said that this will always happen not only because Antonio had more numbers but because it is more difficult to roll a 6. Rodrigo answered that Pedro could also win if he was lucky and rolled a 5 or 6 more often. The students did not find the game fair because Antonio had more numbers and consequently more possibilities.

Carolina: If Antonio stayed with any three numbers and Pedro with another three the game will be balanced.
Rodrigo: OK. But Antonio should have the numbers 1, 3, and 5 and Pedro 2, 4, and 6 or the opposite.

Afterward, Carolina observed that Antonio should have the numbers 1, 2, and 3 and Pedro should have 4, 5, and 6. With this procedure the game would be more balanced. It was suggested that they could play using this new rule. The game had 17 plays with Antonio winning 10 points and Pedro 7.

Carolina: Antonio wins because 1, 2, 3 are more easy to roll.
Researcher: Why?
Carolina: It was easiest because it depends on how to roll the die. It had a trick.
Rodrigo: I don't think so.

*Investigation #2***.** The game is played by two players and involves rolling two dice. Player A gets a point if the sum of the two numbers is 2, 3, 4, 10, 11, or 12. Player B gets a point if the sum is 5, 6, 7, 8, or 9. The first player to get to 10 points is the winner.

Is the game fair? Why? or Why not?
Play the Game with a partner (You can play several games if you need to.)
Do the results of playing the game support your answer to the question above? Explain.

If you think that the game is unfair, how could you change it so that it will be fair?

Carolina and Rodrigo played the second game using players Antonio and Pedro as they did in the first game. Both Rodrigo and Carolina said immediately that Antonio would win because he has more numbers and, more importantly, the highest ones.

In the partial results of this research, we can conclude that students:

a) Know how to represent the problem using a table.

b) Recognize the fairness of the first game.

c) Believe that “tricks” affect the die rolls.

d) Apply the idea that more numbers will define the winner.

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Notes

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