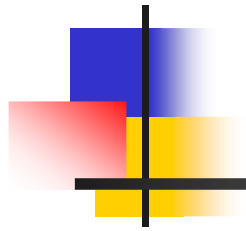


Formatting Real Data in Mathematical Modelling Projects



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Introducing the Problem

- Formatting Power of Mathematics (SKOVSMOSE, 1994);
- Mathematical Modelling within a Critical Mathematical Education perspective;
- To bring the thesis of the “formatting power of mathematics” to educational practice.



Context

- Program: Geography, UFMG;
- 1st semester, 2006;
- Course: Mathematics I;
- Contents: functions, derivatives;
- Activities with computers;
- Mathematical modelling projects.



Objective

- To analyse students' handling of the data gathered during one project.
- May students' procedures be understood as an example of the *formatting power of mathematics*?



Mathematical Modelling in Mathematics Education

an approach, by means of mathematics, to a non-mathematical problem based in reality, or to a non-mathematical situation based in reality, chosen by groups of students in such a way that questions of Critical Mathematics Education form the basis for the development of the work (ARAÚJO, 2002, p. 39).



Critical Mathematics Education

- Development of *mathemacy*;
- Skovsmose (1994), D'Ambrosio (1999);
- In *mathemacy*, the objective is not to merely develop the ability to carry out mathematical calculations, but also to promote the critical participation of students/citizens in society, discussing political, economic, and environmental issues in which mathematics serves as a technological support.



Development of the projects

1. Guidance about developing and writing projects;
2. Definition of themes and groups;
3. Work plan and its evaluation;
4. Plan is carried out;
5. Partial reports and guidance;
6. Final presentation + written report.



The project: Transposition of São Francisco River

Objective: to analyse whether the rainfall in a given region along the course of the river would be sufficient to compensate for the amount of water that would be diverted.

Possibilities:

- Using **mathematics**;
- Problem from **geography**;
- Critical approach.



The group defines procedures

- Before they gather the data:
 - “*Which mathematical model to use*” to represent the quantity of water in the river in the region they had chosen?
 - “*Bernardo and Elton had the idea to use a periodic function with constant [sic] to calculate how much the flow of the river would decrease at some points. Everyone in the group liked the idea and we decided to put it into practice.*”



The group gathers the data

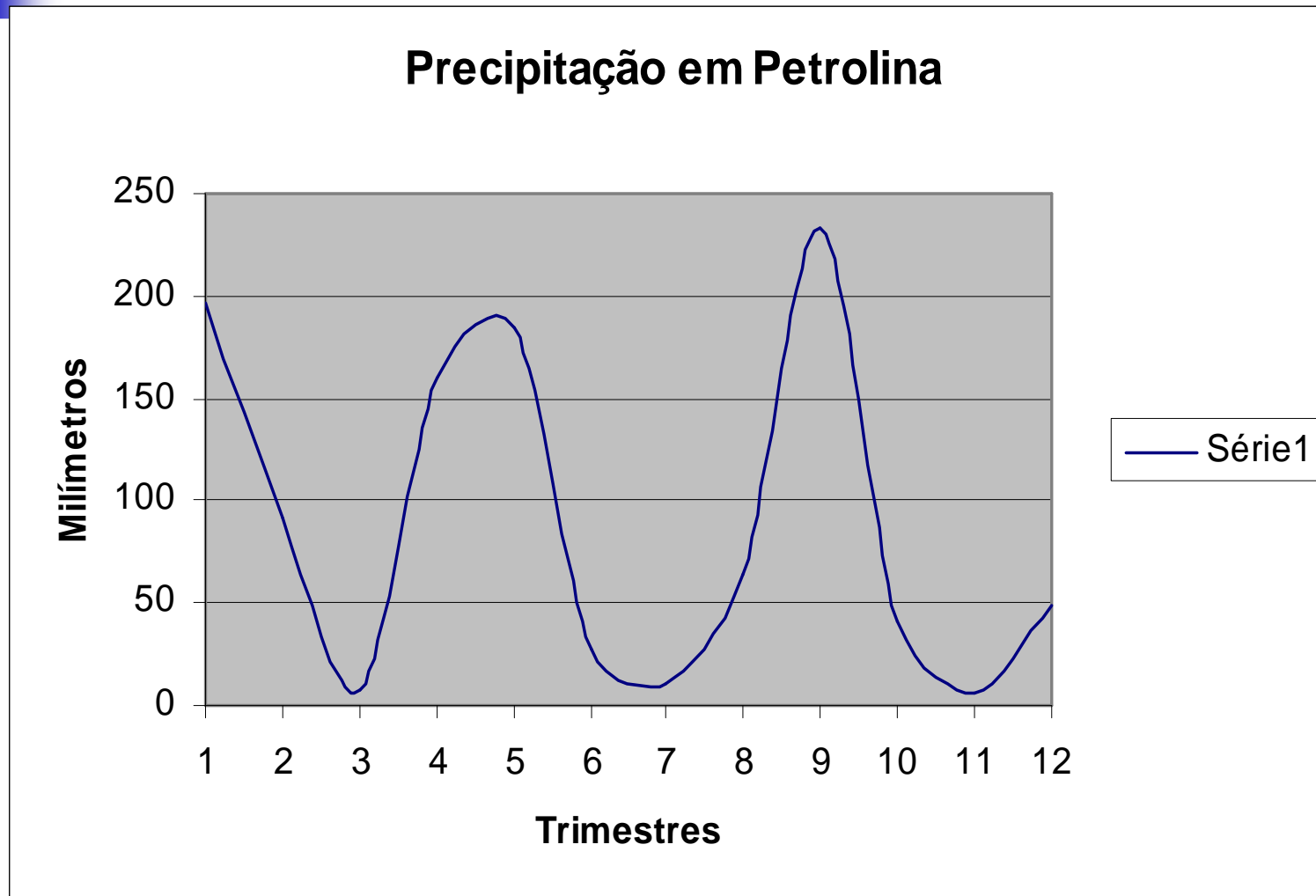
- Data from Internet;
- Daily rainfall from 2000 to 2002, in the cities chosen;
- Excel software to organize and to manage data.



The group handles the data

Elton: *Then we took the rainfall indicator and divided it trimester by trimester, to know the influence that it had in each trimester. That is, how much it rained during each trimester. [...] Because if we had represented it monthly, then, during one year, we wouldn't have had a function ... Then, this function that seems ... that looks like a [pause] sine function, a periodic function ... If we had put just one year, then it wouldn't have had this aspect. Then, we did, we considered by trimester, so it would have this aspect. [Pointing to the graph].*

One graph





After some laughs of the audience...

Elton: [laughing] *I mean ... not "so it would have" this aspect! We didn't force it ... But, doing it this way, it was easier to visualize. That is ... it was possible, but it was a bit strange! This way, it was much easier to observe.*



May students' procedures be understood as an example of the *formatting power of mathematics*?

- No part of reality was projected by the group.
 - ⇒ group's procedure is not an example of this thesis.
- However, a mathematical model was used to format the data gathered by the group.



Social Imagination (NEGT, 1964 *apud* SKOVSMOSE, 1994)

- I could have taken advantage of this situation to ask:

What would happen, in the real transposition of the São Francisco River, if data about precipitation in the region were really treated in the same way by the geographers who work on the real project?



Exemplarity (SKOVSMOSE, 1994)

- intention of applying sociological discussions of Critical Mathematics Education to educational contexts.
- three theses to explain exemplarity:
 - 1) A small phenomenon can be a reflection of a larger complexity.
 - 2) “It is possible to understand a social complexity by concentrating on a particular event.” (p. 77).
 - 3) The objective of education is not to transfer information to the students, but to stimulate them to try to change their own situation.



The group's project

- 1) The procedure of the geography students, using a mathematical model to format rainfall data in a given region, can be a reflection of data handling in larger social situations.
- 2) While discussing and understanding the formatting power of mathematics in the project developed by the group, the entire class could come to understand how this concept could be applied in more complex situations.
- 3) This discussion could lead students to re-think their responsibility as future geographers.



Final considerations

- The discussion about the group's procedure could be broadened to the social phenomenon "Transposition of the São Francisco River".
- The exemplarity of the project developed by the group could provoke a discussion among all the students regarding the formatting power of mathematics in society.



References

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