Early statistics:

Graphical representations in 3rd grade students

Soledad Estrella y Raimundo Olfos

Instituto de Matemáticas

Pontificia Universidad Católica de Valparaíso

CHILE

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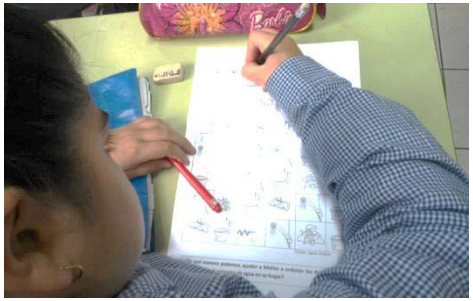
- **Outline**

Research – Methodology – Task – Result – Some graphs – Some diagrams – Discussion

Research

- This research analyses the different comprehensions held by third grade students with regard to **data analysis** and **data representation**.
- The situation about data analysis **was designed by primary school teachers** from the same school as a *LS* group.
- The research focuses on the breadth of **graphical representations** (mostly) similar to bar graphs without scale produced by the children when presented with a data analysis situation.

- We focused our work on **third grade children** to illustrate their comprehension when analyzing data and building graphical representations.
- Therefore, the research is based on the following question:
- **In what ways do third grade students (8 years old) comprehend data analysis and data representation?**

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Methodology

- **Subjects**. 35 students at a mixed Chilean school in the region of Valparaiso. The children worked individually to answer the posed problem. In this study, six cases of students who solved the task are shown.
- **Procedure**. The situation proposed revolved around the question: *"How can we help Matias organise the data to reduce water consumption in his home?"* The data were given to the students on a sheet of paper with images. Each student was given a page with 36 images of water consumption devices in the home of a fictional family (Matias' family) showing data chosen by the teachers in proportion to a real situation (13 toilets, 10 showers, 8 bathroom sinks, 4 kitchen sinks and 1 garden hose). The students produced different representations with these 36 data images.

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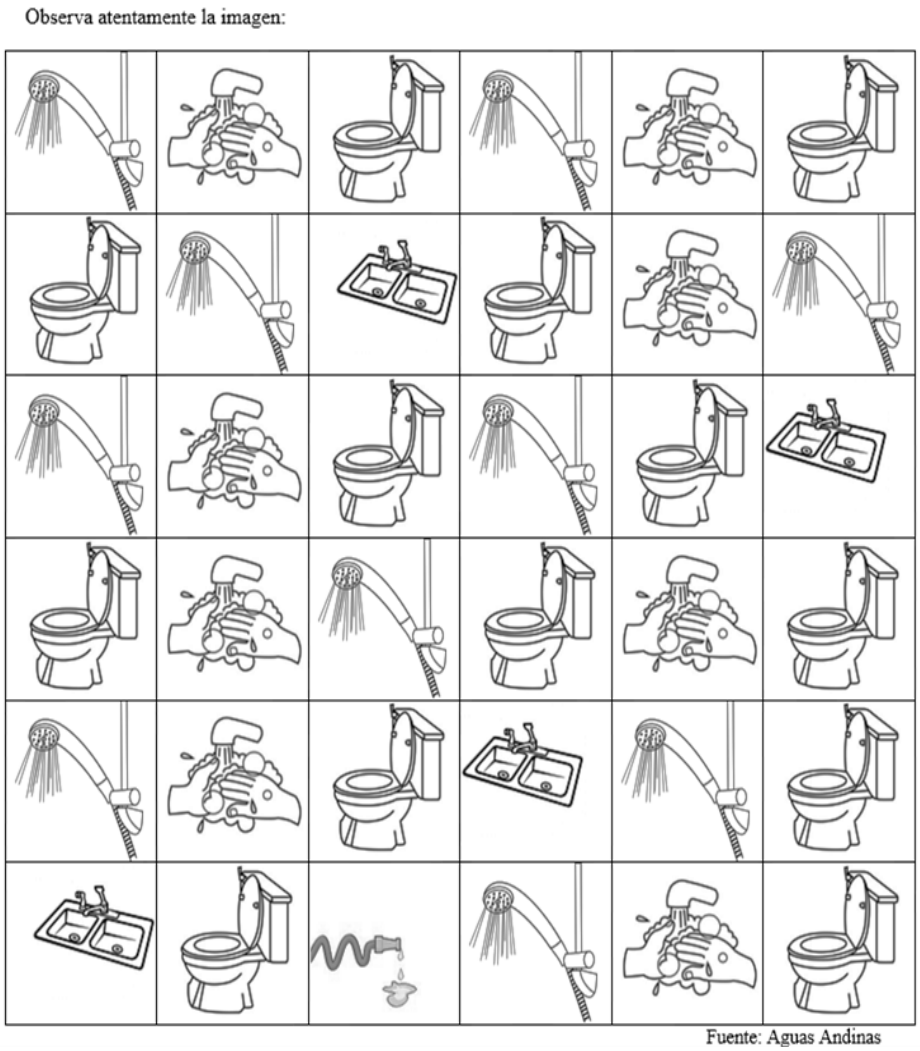

How can we help Matias organise the data to reduce water consumption in his home?

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Results

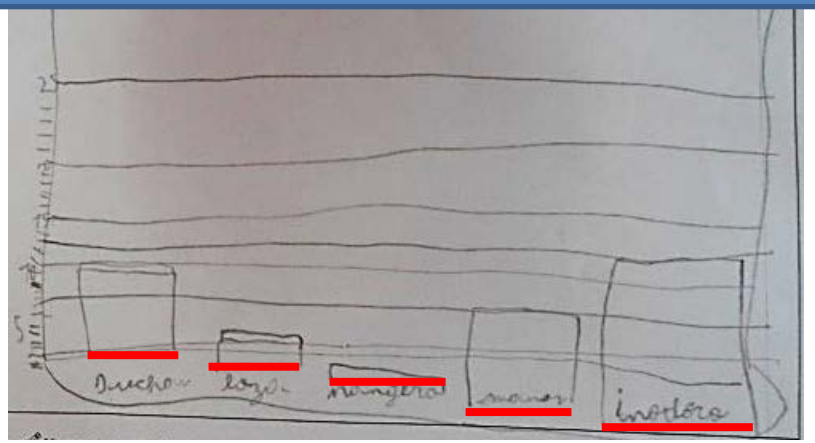
- The six children whose representations were chosen, presented **the data in a numerically form and represented it in different ways, in order to answer the same question**.
- Students' answers that graphically represent the data contain three functional characteristics that allow to compare data (invariantly): ***classification, "graph's linearity" and baseline*.**
- These three characteristics are essential to be **able to compare the data represented and obtain information from the graphs** and answer the central question of the lesson.

Classification, "graph's linearity" and baseline

- Graph 1 shows the use of the baseline (traced along the horizontal axis) and "graph's linearity"
- Graph 2 shows classification and "graph's linearity" (bars) but no horizontal baseline, which may lead to errors in interpretation

Sorting+Grouping+Frequency calculation+Graphing

Graph 1: bar graphs with baseline, classification and *graph´s linearity*

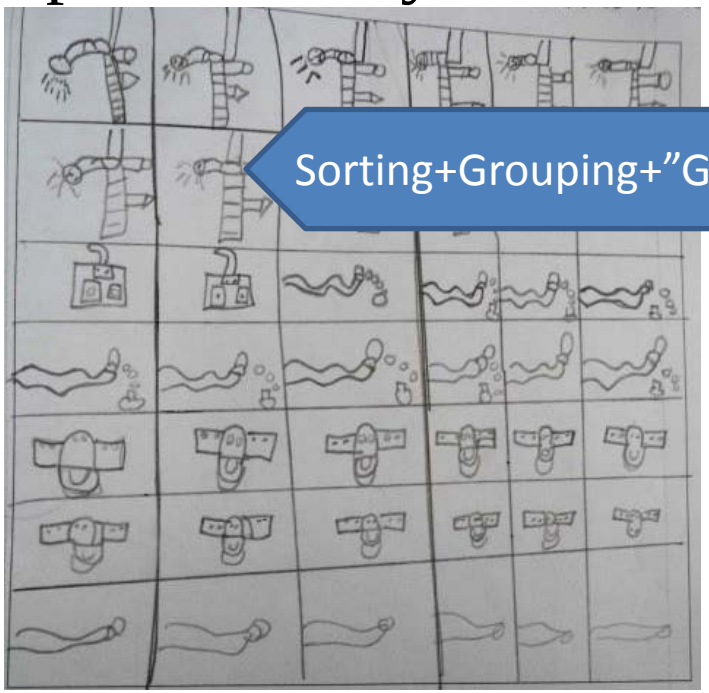


Graph 2: graph without baseline, but with classification and *graph´s linearity*.

Only classification

Graphs 3 and 4 show representations that only include classification and do not allow fast comparisons by visual means, but force counting by category as they do not contain baseline or graph's linearity.

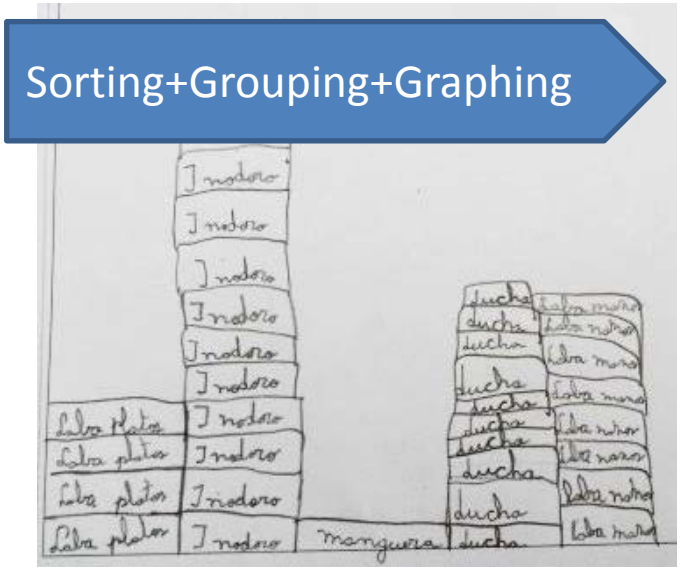
Graph 3: data as text, with classification but without baseline and "graph's linearity"



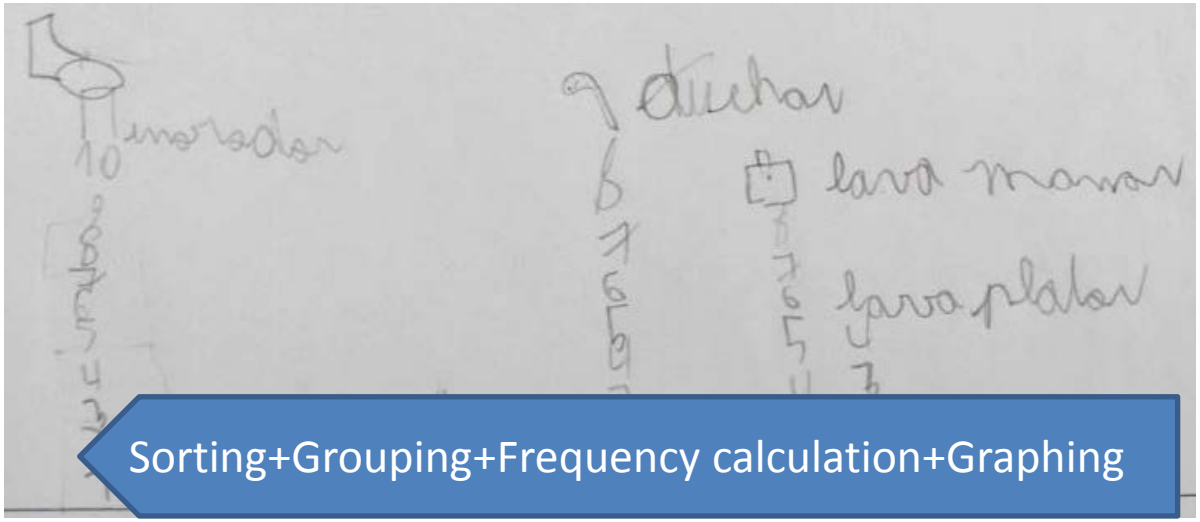
Graph 4: data as icons, with classification but without baseline and "graph's linearity"

Others diagrams

- Graphs 5 and 6 include the invariant characteristics of *classification*, *baseline and "graph's linearity*", but they not presents axes with scale, though they clearly answer the question.
- We gave the name **text-bar** to Graph 5, and **number-bar** to Graph 6; these representations do not appear in the school curriculum as pictograms (because these ones not use same icons).



Graph 5: text-bar, with classification, baseline and graph's linearity.



Graph 6: number-bar, with classification, baseline and graph's linearity .

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Discussion

- This study analysed the representations produced by third grade students in the context of data analysis. The freely-produced graphs show firstly the **identification of classes of variable (classification), order of data presentation ("graph's linearity")** and **graph construction using a basis to allow visual comparison (baseline)**.
- Furthermore, transnumeration techniques were also observed. Allowing and encouraging the **emergence of different types of pictograms, such as number-bars and text-bars**, could lead to comprehension and interpretation of data prior to the teaching of pictograms.
- Free construction of data representations allows student to develop interpretation and evaluation abilities for graphical representations, providing a initial basis for constructing the elements of graphs, such as units, scale and axes (coordinating the geometrics and numerical components).
- Future studies: we will investigate about the coordinations in the construction process of data representation.

THANK YOU FOR YOUR ATTENTION

SOLEDAD.ESTRELLA@PUCV.CL
RAIMUNDO.OLFOS@PUCV.CL

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