Early statistics:
Graphical representations in 3rd grade students

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

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

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

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References


