

JUDGING “AS MUCH AS” BEFORE FORMAL INSTRUCTION TO MEASURE

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The common western approaches to number in mathematics education prevalently assign a primitive and a priori role to natural numbers and to the action of counting discrete, countable magnitudes (Iannece, Mellone & Tortora, 2009). A different approach was proposed by Davydov who placed the experience of measuring continuous quantities as preliminary to the introduction of numbers (Davydov, 1982). Drawing from Davydov's assumptions we carried out an explorative study, to analyse the behaviour of children at the beginning of the first grade when working with a particular kind of magnitude, so to say, intermediate between discrete and continuous: rice. We interviewed 19 first grade children from an Italian school at the beginning of the school year. The children were interviewed one at a time, outside of the classroom setting, in a social interaction with the interviewing researcher (one of the authors). The interviewer picked up a bag containing about ½ kg of rice and she poured about 200 grains onto a table lifting the bag and slowly letting the rice pour out. Then the interviewer would ask the child: “Now can you please give me as much as you have in front of you?”, and then when the child had finished: “How are you sure they are the same [pointing to one pile of rice and then to the other]?” offering the child a variety of artefacts to choose from if he/she thought they would be helpful. Our observations show that only few children chose to count the grains, managing the substance as discrete, and, not surprisingly these happened to be the children who were particularly confident in handling large numbers. On the other hand, the children who treated the rice as continuous made different attempts to reduce the complexity of comparing two continuous quantities by, for example, flattening the piles and evaluating their surfaces; or comparing the heights of piles or putting them in two equal containers and so on. In this direction we recognized in the children's behaviours the similar remarkable insight to simplify the complexity of the comparison of two quantities by acting on them in order to focus only on one of their properties: in the discrete approach the chosen property is of course the numerosity; while in continuous approaches they chose to focus on the length, surface or volume.

References

- Davydov, V. V. (1982). The psychological characteristics of the formation of elementary mathematical operations in children. In T.P. Carpenter *et al.* (eds.), *Addition and Subtraction: A cognitive perspective*. Hillsdale, NJ: Lawrence Erlbaum, 224-238.
- Iannece, D., Mellone, M. & Tortora, R. (2009). Counting vs. measuring: reflections on number roots between epistemology and neuroscience. In M. Tzekaki, M. Kaldrimidou & H. Sakonidi (eds.), *PME33* (Vol. 3, pp. 209-216). Thessaloniki, Greece: PME.