

RATIO COMPARISON: PERFORMANCE ON RATIO IN SIMILARITY TASKS

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Since 1996 a study about ratio, proportion and proportionality learning and teaching has been carried out at Valencia (see for example, Fernández and Figueras, 1999; Fernández et al, 1998). As part of this research an investigation to identify the ways in which secondary pupils —13 to 16 years old— solve Σ -construct tasks (Freudenthal, 1983) was made. These tasks comprise problem situations related to similarity, scale, the use of Thales theorem and the graphic of linear functions.

Students' answers to ratio comparison problems of a paper and pencil test in which similarity criteria play an important role were analysed using a classification scheme built up for other parts of the aforementioned global research. In search of elements which could serve as a framework to further understand pupils' answers a study with mathematics teachers was done. Interviews were made individually in a group setting, where teachers were asked to solve the pupils tasks, to describe their strategies and to compare them with those of their colleagues, to assess students answers and to discuss their characterisation.

The purpose of this communication is to describe cognitive tendencies in students' and teachers' ways of reasoning. Characterisation of pupils and teachers performance took into account criteria for preservation of ratio in similarities such as: preservation of equality of lengths, of angles, of congruence, of internal ratios and constancy of external ratios. Two differentiated types of reasoning were identified. One called "formal" was characterised by the use individuals do of necessary and sufficient criteria to sustain their answers. The other type named "qualitative performance" due to the use of visual reasoning which considers aspects that are necessary but not sufficient. These aspects are based fundamentally on the perception of form and relations that can be identify in a visual inspection of figures. Among the relevant results it can be mentioned the identification of similar behaviours between students and teachers. The qualitative performance of some of the teachers shows that it is necessary to design a teaching model (in the sense of Filly, 1999) based on visual reasoning which favours the construction of mental objects closer related to the ratio in similarity mathematical concept.

Fernández, A. and Figueras, O. (1999): Density ideas in primary school. In Hitt, F. and Santos, M. (Eds.): Proceedings of PME-NA XXI, Vol 2, p. 614. Columbus, OH: ERIC.

Fernández, A., Gómez, B., Figueras, O., Margarit, J., Puig, L., Monzó, O. and Ruíz, E. (1998): *Estudio en la escuela primaria sobre competencias vinculadas a la razón y la proporción*. Research report. Valencia: Universitat de València.

Filloy, E. (1999): *Aspectos teóricos del álgebra educativa*. Mexico: Grupo Editorial Iberoamérica.

Freudenthal, H. (1983): *Didactical Phenomenology of Mathematical Structures*. Dordrecht: D. Reidel.