

A TEACHING MODEL FOR RATIO COMPARISON, PROPORTION AND DENSITY

Alejandro Fernández

Luis Puig

Universitat de València, Spain

Alejandro.Fernandez@uv.es

luis.puig@uv.es

Olimpia Figueras

Centro de Investigación y de Estudios

Avanzados del IPN, Mexico

dfiguera@mailier.main.conacyt.mx

The work reported in this communication is part of a research project whose main objective is the building up of a local theoretical model of ratio, proportion and proportionality which enables the organization of the teaching of those mathematics contents from the first grades of primary school up. Such construction requires the characterization and integration of four main components: the formal competence component, the cognitive component, the communication component and the teaching component (Filloy, 1999). Freudenthal's (1983) phenomenological analyses of the mathematical ratio concept has been taken as a starting point for structuring a formal competence model.

A didactical phenomenology has shown that an important role is played in the track towards the constitution of the ratio and proportion mental object by mental objects precursors of this mental object. A number of those mental object precursors have a qualitative character and involve ratio comparison as the context in which the equality of ratios, that is, the proportion can be given sense. A particularly important one is the mental object called "relatively" by Freudenthal which has been used by Fernández (2001) to design parts of a teaching model. The didactical sequences structured about the density concept emphasizing ratio unities, as well as its experimentation by means of two teaching interviews that constitute case studies is the theme of this communication.

The performances in a paper and pencil test of both primary students, a fourth and a sixth graders, were characterized by a classification scheme (see for example Fernández and Figueras, 1999). That characterization enabled us to identify a performance tendency: the use of qualitative compensations (according to Lammon, 1993). The teaching model improved children's knowledge in both cases. However, the fraction knowledge better mastery of the elder pupil provided a further understanding of density tasks as well as a more appropriate use of ratio unities.

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. (2001): *Precursores del razonamiento proporcional: Un estudio con alumnos de primaria*. Ph.D. Theses 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.

Lammon, S. (1993): Ratio and proportion: Children's cognitive and metacognitive processes. En Carpenter, T., Fennema, E. and Romberg, T. (Eds): Rational numbers. An integration of research. Lawrence Erlbaum Associates. pp. 131- 155.