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Voskoglou, Michael Gr.; Kosyvas, Georgios D.

Analyzing students' difficulties in understanding real numbers.

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Summary: This article reports on a study of high-school and of technologist students (prospective engineers and economists) understanding of real numbers. Our study was based on written response to a properly designed questionnaire and on interviews taken from students. The quantitative results of our experiment showed an almost complete failure of the technologist students to deal with processes connected to geometric constructions of incommensurable magnitudes. The results of our experiment suggest that the ability to transfer in comfort among several representations of real numbers helps students in obtaining a better understanding of them. A theoretical explanation about this is obtained through the adoption of the conceptual framework of dimensions of knowledge, introduced by *D. Tirosh* et al. [Educ. Stud. Math. 35, No. 1, 51–64 (1998; ME 1998d.02785)] for studying the comprehension of rational numbers. Following in part the idea of generic decomposition of the APOS analysis [*K. Weller* et al., Can. J. Sci. Math. Technol. Educ. 9, No. 1, 5–28 (2009; ME 2012b.00597)] we suggest a possible order for development of understanding the real numbers by students when teaching them at school. Some questions open to further research are also mentioned at the end of the paper.

Classification: D74 F54

Keywords: real numbers; rational numbers; irrational numbers; algebraic numbers; transcendental numbers; fractions; decimals; representations of real numbers

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