MATHEMATICAL ABSTRACTION IN MATHEMATICS LEARNING: ENHANCING PRE-SERVICE MATHEMATICS TEACHER COMPETENCY

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Abstract

The aim of this research is to reveal students' mathematical abstraction, a cognitive process that takes place in students' mind, used to construct new concepts based on their previous understanding. Students' mathematical abstraction, which plays important roles in designing mathematics instruction, can be used by teachers to understand students' learning process and strengthening their mathematical thinking skills. To analyze a process of abstraction, a learning context as a trigger, should be designed to ensure that students' abstraction would appear in the process of teaching and learning. This study was conducted in six months, involving 45 pre-service mathematics teachers, who attended Analytic Geometry course. The participants were asked to construct six knowledge elements in Parallel Coordinates topic after learning concepts of Cartesian coordinate, after which they took a prior knowledge test on Cartesian coordinate concepts. The result of the research, based on the analysis process of collected data through video recording, students' worksheet, test, and field notes, indicate that the abstraction process of pre-service mathematics teachers in learning low-level knowledge elements mostly takes place in group context, whereas their abstraction process in learning high-level knowledge elements take places in classroom context. In addition, it is obvious that reducing abstraction can help participants in constructing new mathematical knowledge.

Keywords: Mathematical abstraction, Mathematical Learning, Pre-Service Mathematics Teachers, Mathematics Teacher Competency, Parallel Coordinate.

References

Cifarelli, V. (1988). *The Role of Reflective Abstraction as Learning Processes in Problem Solving*. Dissertation: Unpublished.

Dreyfus, T., Herskowitz, R., and Schwarz, B. (2015). T*he Nested Epistemic Actions Model for Abstraction in Context: Theory as Methodological Tool and Methodological Tool a Theory* in Bikner-Ahsbahs, A, et al: Approaches to Qualitative Research in Mathematics Education, 185-217, New York: Springer.

Ferari, P. L. (2003). “Abstraction in Mathematics”, in L. Saitta (ed), *The abstraction paths*: *from experience to concept*, Phil. Trans. R. Soc., Lond. B, v.358, n.1435, 1225-1230.