Prospective Mathematics Teachers' Content Knowledge on the Definition of Limit and Derivative

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Abstract : Teachers should have robust and comprehensive content knowledge for effective mathematics teaching. It was explained that content knowledge includes knowing the facts, truths, and concepts; explaining the reasons behind these facts, truths and concepts, and making relationship between the concepts and other disciplines. By virtue of its importance, it will be significant to explore teachers and prospective teachers' content knowledge related to variety of topics in mathematics. From this point of view, the purpose of this study was to investigate prospective mathematics teachers' content knowledge. Particularly, it was aimed to reveal the prospective teachers' knowledge regarding the definition of limit and derivate. To achieve the purpose and to get in-depth understanding, a qualitative case study method was used. The data was collected from 34 prospective mathematics teachers through a questionnaire containing 2 questions. The first question required the prospective teachers to define the limit and the second one required to define the derivative. The data was analyzed using content analysis method. Based on the analysis of the data, although half of the prospective teachers (50%) could write the definition of the limit, nine prospective teachers (26.5%) could not define limit. However, eight prospective teachers' definition was regarded as partially correct. On the other hand, twenty-seven prospective teachers (79.5%) could define derivative, but seven of them (20.5%) defined it partially. According to the findings, most of the prospective teachers have robust content knowledge on limit and derivative. This result is important because definitions have a virtual role in learning and teaching of mathematics. More specifically, definition is starting point to understand the meaning of a concept. From this point of view, prospective teachers should know the definitions of the concepts to be able to teach them correctly to the students. In addition, they should have knowledge about the relationship between limit and derivative so that they can explain these concepts conceptually. Otherwise, students may memorize the rules of calculating the derivative and the limit. In conclusion, the present study showed that most of the prospective mathematics teachers had enough knowledge about the definition of derivative and limit. However, the rest of them should learn their definition conceptually. The examples of correct, partially correct, and incorrect definition of both concepts will be presented and discussed based on participants' statements. This study has some implications for instructors. Instructors should be careful about whether students learn the definition of these concepts or not. In order to this, the instructors may give prospective teachers opportunities to discuss the definition of these concepts and the relationship between the concepts.

Keywords : content knowledge, derivative, limit, prospective mathematics teachers