

# **SOME CHARACTERISTICS OF STUDENTS' INNER WORLD IN LEARNING SCHOOL MATHEMATICS**

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Takahashi(2000) proposed that students had internal frames of reference which were their own grounds to view something, to perceive something and to reason in learning school mathematics. Four participants were interviewed two times in grade six and two times in grade seven. Eight modalities of the participants' inner worlds, which make up their internal frames of reference, were found. They were their view of mathematics, attitude/affection towards mathematics, objectifying knowledge, influence of significant others, ways of learning, relating mathematics with daily life, relating mathematics with other subjects, and formalized mathematical knowledge.

This research was extension of Takahashi(2000). The purpose of this research was to explore some of the characteristics of modalities of internal frames of reference in students' learning mathematics through additional two interviews.

This research was based on Polanyi's theory of knowledge. Polanyi (1958) proposed that scientific knowledge doesn't exist as an impersonal universally established. Mathematical knowledge of a society also consists of relationships between personal knowledge and includes a tacit dimension. Owing to the tacit dimension we can try to know actively through intellectual passion, images, and the belief in the existence of mathematical answers to problems.

Knowing depends on a conceptual framework which either assimilates new experiences or ideas, or adapts to them. The framework includes a tacit dimension which supports and fosters the activity of the framework. The tacit dimension is key domain to form internal frames of reference. Polanyi's theory proposes that knowing constructs metaphorical relationships in our mind. The theory has the same standpoints as Lakoff, Johnson and Núñez'.

Three of four participants were interviewed six times and one was interviewed five times. At fifth and sixth interviews the participants were eighth graders.

As results there were remarkable changes in two participants' modalities. One student changed her way of learning based on the change in her view of mathematics. Another student changed his way of learning based on the relationship with his friends. There weren't remarkable change in the other two participants.

Polanyi, M. (1958). *Personal knowledge: Towards a post-critical philosophy*. Chicago: The University Chicago press.

Takahashi, H. (2000)□Modalities of students' internal frames of reference in learning school mathematics. In T. Nakahara & M. Koyama (Eds.) *Proceedings of the 24th Conference of the International Group for the Psychology of Mathematics Education* (Vol.4, pp.185-192). Hiroshima: Hiroshima University.