

Abstract

Mathematics Teachers' Pedagogical Content Knowledge of Algebra Unit in Grade Eight

Dr. Maher Hashweh (Advisor).

Dr. Fateen Massad, Dr. Agnes Hanania.

This study aimed to describe the pedagogical content knowledge of the social constructivist math teachers of an algebra unit within the 8th grade curriculum. To realize this goal, the study tried to answer the following question:

What is the mathematics teachers' pedagogical content knowledge of an algebra unit for the 8th graders?

The study was based on Hashweh's definition (Hashweh, 2005) of pedagogical content knowledge.

The study's community is formed of all 8th grade math teachers in the Palestinian government and private schools in Ramallah District. The sample of the study was composed of two math social constructivist teachers (one male and one female) whose selection was based on their responses to the cognitive beliefs questionnaire.

Four research instruments were used to answer the question of the study. These instruments were the cognitive beliefs questionnaire to identify the study sample, the content test to assess the teacher subject matter knowledge. The basic instruments of the study were individual interviews and classroom observations of the study samples.

The results were the following:

First, the female teacher's knowledge:

The female teacher had more social constructivist beliefs than constructivist ones. She used group work while teaching the unit, but without a good distribution of the roles of the students within the group. Her objectives were clear and well defined for both the special as well as

the unit's objectives as a whole. The teacher showed weakness in her content knowledge to some extent. This was reflected in the way she dealt with the misconception that her students had. She would not resort to confrontation but accedently. In the same time, she showed some awareness of the individual differences among her students. She gave some interest for the weak students. She took in consideration the prior concepts that the students held. The teacher related the unit to the following units in the book, but she was not always succesful in relating the concepts of the unit itself or with prior knowledge. She presented the material in various ways (group work, work sheets), but she did not use metaphores.

She was always well prepared and her paperwork was also ready all the time. She showed a successful class management as well as good curriculum knowledge. Her contexts knowledge in both the social and the educational was good.

The study came up with the conclusion that the teacher owned reasonable but not sufficiant pedagogical content knowledge in the algebra unit. Some parts of her knowledge need to be developed and enriched especially for the metaphores and the misconceptions.

Second, the male teacher's knowledge:

The male teacher tended to have constructivist beliefs rather than being social constructivist. He did not show an awareness of the important of the dialogue and group work in teaching.

Nevertheless, he showed a good content knowledge since he sought to intentionally confront misconceptions that his students held. He brialliantly related the prior knowledge and new ones using sometimes the prior knowledge in clarifying some of the ambiguity in the new knowledge.

He was also brilliant in relating the units of the book, like relating the unit with the previous and the following units of the book. He showed awareness in the individual differences among the students.

The teacher realized the importance of the metaphores in teaching; therefore he used various metaphores in teaching the unit. The teacher ignored prepreparation for his class, but depended heavily on his teaching experience. Despite his knowledge of the various teaching resources, the teacher did not try to employ that knowledge. The teacher showed a good class management to the degree that he did not allow some of distriances to hinder his class. Nevertheless, his context knowledge was not sufficient; therefore, he did not show a sufficient interest in what the directorate of education issues.

The study came up with the conclusion that the teacher had a good pedagogical content knowledge of the algebra unit, but it was not rich enough. Therefore some aspects like that of the beliefs, context, and teaching strategies need to be developed.

In general, both teachers tended to adopt the traditional kind of teaching despite their beliefs. Both teachers had strong as well as weak points, but fortunately, we can build on the strong points to develop their pedagogical content knowledge. On the other hand, the male teacher's pedagogical content knowledge in algebra unit proved to be to some extent better than that of the female for many reasons like teaching experience, the number of math courses taken during university education, and the content knowledge.

The study recommended that it was necessary to conduct more studies regarding the pedagogical content knowledge depending on Hashweh's definition on other subjects other than algebra. It also recommended the joining of in- services teachers in constructivist/ social constructionist courses and familiarizing them with the new educational theories, and the

inclusion of those theories in the pre-service teachers teaching programs in the educational establishments. The study also recommended conducting a study about the influence of gender on pedagogical content knowledge.

In addition to the abovementioned, and at the teacher's performance developing level, the study recommended the necessity of organizing a teacher guide to include the various methods to teach math in general, how to relate math problems to real life, and presenting the misconceptions regarding the various math subjects and how to make the conceptual change that needed and face them.

The study concluded that a special pedagogical content knowledge for algebra could be reached, especially after it became known depending on the previous studies and the results of the current study that algebra's teaching methods are the same all over the world. However, what makes it special is the way the teacher applies them in the classroom.