Difficulties in Teaching Whole Numbers and Suggested Solutions

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Extended Summary

Introduction

Difficulty in mathematics can be defined as the difficulties experienced by students regarding concepts, operations, symbols and formulas during their learning. Students who have grown accustomed to performing operations with natural numbers in elementary school can experience difficulty when they encounter whole numbers in middle school. For instance, a student who has grown accustomed to performing operations with natural numbers can easily perform the operation \(2+3=5\) whereas he/she can experience confusion when he/she encounters an operation such as \([-2)-(-3)\]. It can be stated that the reasons for this confusion are the fact that the students encounter negative numbers for the first time and they transfer the operations that they perform in natural numbers to these numbers in the same manner.

It is important to conduct the instruction process in a productive way in order for the student to learn mathematics effectively. In this regard, it can be argued that teachers play an important role in effectively teaching the subject of whole numbers. As a matter of fact, it is stated that the teacher efficacy factor is of great importance in students’ learning mathematics (Erdem and Soylu, 2013; Erdem et al., 2015; Gürbüz, Erdem and Gülburnu, 2013; NCTM, 2000; Romberg and Carpenter, 1986). Teachers’ content knowledge and pedagogical content knowledge are among the important factors that are influential within the scope of teacher efficacy (Shulman, 1987). Therefore, teachers must possess adequate content knowledge and must transfer this knowledge to the students in an effective way in order to teach them the subject of whole numbers efficiently. When the aforementioned explanations are taken into account, it is believed that it is necessary to examine teachers’ opinions...
on this issue since difficulties are experienced in learning and teaching the subject of whole numbers.

**Purpose**

The aim of this study is to examine middle school mathematics teachers’ opinions regarding the difficulties in teaching the subject of whole numbers, and offer related solution suggestions.

**Method**

The study group of the research is composed of 38 middle school mathematics teachers who are working in different schools located in city center of Adıyaman. The principle of voluntariness was taken into account when selecting the participants among the teachers. In order to keep the identities of the teachers in the study group confidential, they were given codes as M₁, M₂, M₃,..., M₃₈. While directly conveying the opinions of teachers, their year-based occupational experiences were given, too. A form composing of two open-ended questions was prepared by the researchers as the data collection tool in order to determine what kind of difficulties are experienced in learning and teaching the subject of whole numbers. Expert opinion was taken to decide whether or not these questions were suitable for the aim of the study. The questions included in this form are given below.

1. **Do you experience difficulty in teaching the subject of whole numbers? If so, what kind of difficulties do you experience?**
2. **What kind of difficulties do students experience in learning the subject of whole numbers?**

The researcher conducted pilot experiments with three teachers in order to maintain the reliability of the prepared questions. Whether or not the questions were understood by the teachers was checked accordingly. At the end of this conducted pilot study, the questions within the form were organized and finalized. Furthermore, no time limit was stipulated for the participants to answer the questions within this form. By doing so, an attempt was made to obtain more detailed data regarding the difficulties experienced in the subject of whole numbers. Consequently, the form was filled in by the participants in periods ranging from one week to one month (one week being the shortest completion period and one month being the longest).

The content analysis technique was used in analyzing the data obtained from the study. In this regard, the data of the research were examined in detail by different researchers; coding processes were performed; obtained categories were compared; and five categories were reached upon agreement.

In order to maintain reliability, Miles and Huberman’s (1994) reliability formula (reliability = agreement/(agreement + disagreement)) was utilized. Accordingly, coding reliability was calculated as 0.85. Moreover, some obtained data were con-
veyed directly since it was believed that direct quotations would be effective in reflecting the individuals’ thoughts without a change in qualitative evaluations (Yin, 2011).

Results

At the end of the conducted content analysis, the following categories were reached: *Failure to Use the Minus (-) Sign, Failure to Perform Subtraction Operation in Whole Numbers, Failure to Sort Whole Numbers, Failure to Understand Counters and Failure to Associate Them with Daily Life*. In view of this, it was found that the students experienced difficulty in using the minus (-) sign, performing subtraction operation in whole numbers, sorting whole numbers, understanding counters and associating them with daily life; whereas the teachers had trouble in teaching what negative whole numbers mean, teaching subtraction operation in whole numbers and using counters. According to descriptive statistics results regarding these categories, it was found that all participants agreed that the students were not able to use the minus (-) sign. In other words, all participants stated that the students experienced difficulty in understanding negative whole numbers. On the other hand, 39% of the participants stated that the students experienced difficulty in performing subtraction operation in whole numbers; 21% of them stated that the students experienced difficulty in sorting whole numbers; 29% of them stated that the students experienced difficulty in understanding counters; and 38% of them stated that the students experienced difficulty in associating them with daily life.

Since students are still in the period of concrete operations during middle school, it is thought that it is necessary to use suitable concrete models in teaching the subject ‘whole numbers’ and associating with examples from daily life. Also, it can be said that counters should not be preferred especially in teaching multiplication and division of whole numbers.