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**The Response of Preservice Teachers to Algebraic Misconceptions of Students**

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**Abstract:**

The purpose of the study was to determine which types of misconceptions were the most difficult to address and how the performance in eliminating algebra misconceptions was related to preservice teachers’ (PST) problem solving knowledge and teaching efficacy.

One of the obstacles that impede mathematics proficiency is the presence of algebra misconceptions. We believe that mathematics PSTs should be fully equipped in detecting and eliminating misconceptions before they reach their classroom.

In this study we gave middle school mathematics PSTs assignments where they were tasked to help students with misconceptions about ratios, proportions, decimals, percents, surface areas and volumes.  In addition to the assignments, we gave a test where the majority of the questions were about algebra and other questions on how PSTs would assist a student who needed help with misconceptions. Besides these assignments and the test, an instrument evaluating PSTs’ beliefs about teaching was given.

We present the results of our investigation and highlight the misconceptions that caused the majority of the problems. The beliefs of the PSTs that are related to their capacity to overcome algebra misconceptions are also presented.

**Discussion:**

Algebra is an important mathematics subject that serves as a gateway for more advanced subjects (Usiskin, 1995; West, 2013), however, it is also a difficult subject for students.  Studies have shown that students develop misconceptions about algebraic concepts such as algebraic equations (Bush & Karp, 2013; Powell, 2012; Welder, 2012), functions (Li, 2006), proportions (Dogan & Cetin, 2009; Kaplan, Isleyen, & Ozturk, 2011), variables, constants, and unknowns (Kocakaya Baysal, 2010; Li, 2006).  Therefore, it is crucial to teach algebra in a way that the students learn it without misconceptions.  To do that, teachers need to have very good content knowledge.  If a teacher has a misconception about an algebraic concept, which was a case in studies such as those by Davis (1995) and Huang & Kulm (2012), this will affect students’ learning.  In addition, a teacher must be able to detect as early as possible the presence of misconceptions among her students and be skillful in correcting them.

It is our belief that one of the most efficient means of ensuring that our mathematics teachers can appropriately teach algebra so that misconceptions do not arise and prior ones are removed, is to empower the preservice teachers with the skills and knowledge necessary to prevent and correct algebra misconceptions.  Thus, we have made this one of our primary objectives as teacher educators.

In this study, middle school mathematics preservice teachers were given assignments where they were asked to deal with possible algebraic misconceptions about ratio, proportion, decimals, percents, surface area and volume.  In these assignments, we asked preservice teachers to explain how they would assist middle school students about these specific misconceptions.  Using these data, we were able to obtain answers to our research questions, (1) which algebraic misconceptions are most difficult for preservice teachers to address? (2) How is the performance of preservice teachers in addressing misconceptions related to their algebra knowledge, specifically problem solving knowledge; and (3) How is this performance related to their teaching self-efficacy?

The examination of preservice teachers’ explanations was an important component of our study because they gave us information about both content and pedagogical knowledge of the PSTs. Both are necessary in order to be fully helpful to their students (Kulm, 2008).