



Universidad de Sonora

Maestría en Ciencias con Especialidad en Matemática Educativa

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Indicaciones: Para el texto que se muestra a continuación, realice las tareas solicitadas:

- a) Tradúzcalo.
- b) Elabore un resumen de 10 renglones.

Algebra Teaching and Learning

The learning and teaching of the area of mathematics known as school algebra has traditionally involved the secondary school student (approximately 12–18 years of age) and has focused on forming and operating on polynomial and rational expressions, representing word problems with algebraic expressions and equations containing variables and unknowns, and solving algebraic equations by means of axiomatic and equivalence properties. However, over the past several decades, changes in perspective as to what constitutes school algebra have occurred, with the result that several different conceptualizations of school algebra have emerged. For example, Arcavi et al. (2017) define the aims of school algebra as including “expressing generalizations, establishing relationships, solving problems, exploring properties, proving theorems, and calculating” (pp. 2–3). In Stacey and Chick (2004), school algebra is seen as “a way of expressing generality; a study of symbol manipulation and equation solving; a study of functions; a way to solve certain classes of problems; and a way to model real situations” (p. 16). The lack of universality regarding definitions of school algebra is emphasized by Leung et al. (2014) who provide evidence that algebra lessons around the world can vary not only from country to country, but also within country, and that this diversity can be characterized not only in terms of content but additionally as to whether the main focus is either procedural or conceptual or some combination of the two.

Some years ago, Freudenthal (1977) characterized school algebra as consisting of not only the solving of linear and quadratic equations but also algebraic thinking, which includes the ability to describe relations and solving procedures in a general way. This latter facet highlighting algebraic thinking, quite novel at the time, not only opened up additional dimensions for conceptualizing school algebra at the secondary level but also provided an avenue for developing an algebraic thread in primary school mathematics, resulting in a movement that has come to be referred to as *early algebra* or the *algebraization* of arithmetic (e.g., Cai and Knuth 2011; Kaput et al. 2007; Kieran 2018; Kieran et al. 2016). At the core of this movement at the primary school level has been a focus on mathematical

relations, patterns, and arithmetical structures, with detailed attention to the reasoning processes used by young students, aged from about 5 to 12 years, as they come to construct these relations, patterns, and structures – processes such as noticing, seeking structure, conjecturing, generalizing, representing, and justifying. A notable aspect of the cultivation of algebraic thinking with the younger student is the use of alternatives to alphanumeric symbols (e.g., words, artifacts, or other mathematical signs) for the expression of generality involving indeterminate objects (see Radford 2018). To sum up, contemporary definitions of school algebra, while remarkable for their diversity, embrace on the one hand, sign-based activity involving mathematical objects and the structural relations between them and, on the other hand, the mathematical thinking processes underpinning such activity. Because the focus of this encyclopedia entry is on the teaching and learning of school algebra involving the student aged about 12 up to 18 years of age, the reader is encouraged to consult the entry on *Early Algebra Teaching and Learning* for material related to students younger than this.