

Contents

1	Introduction	1
2	Survey of the State of the Art	3
2.1	Brief History of Early Algebra Movement and Its Research up to the Early 2000s	3
2.1.1	The Early Algebra Movement	3
2.1.2	The Development of Algebraic Thinking in the Early Grades: Some Examples	4
2.1.3	Concluding Remarks: Early Algebra Research in Years Leading up to Early 2000s	9
2.2	Recent Research on Early Algebra Learning and Further Evolution of the Field	10
2.2.1	The Nature of Early Algebraic Thinking	10
2.2.2	Processes of Early Algebraic Thinking	11
2.2.3	Mathematical Content Areas of Early Algebraic Thinking	12
2.2.4	Implications for Future Research	15
2.3	Bringing Early Algebra into Elementary Classrooms	16
2.3.1	The Nature of Early Algebraic Content in Classroom Contexts	16
2.3.2	Roles of Students and Teachers in Classrooms	20
2.3.3	What Can Happen in Classrooms in General?	21
2.3.4	Conclusion	22
2.4	A Neurocognitive Perspective on Early Algebra	22
2.4.1	Singapore Model Method to Solve Arithmetic and Algebra Problems	23
2.4.2	Different Methods Used to Solve Secondary Algebra Word Problems	23
2.4.3	Neuroimaging, the Model Method, and Algebra	25

2.4.4 Why Algebra May Be the More Resource Intensive of the Two Methods	27
2.4.5 Competent Adults and Children Process Arithmetic Information Differently	30
2.5 Concluding Remarks	31
3 Summary and Looking Ahead	33
References	35