Mathematics Curriculum in School Education: Advancing Research and Practice from an International Perspective

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Abstract Mathematics curriculum, often a focus in education reforms, has not received extensive research attention until recently. To advance relevant research and practice in mathematics curriculum, this book is designed to survey, synthesize, and extend current research development on mathematics curriculum in different education systems. In this introduction chapter, we highlight the background of this book project, its purposes, and what can be learned from reading this book.

Keywords Curriculum research · Education system · International perspective · Mathematics curriculum · School education · School mathematics

Introduction

School education is organized to provide students with structured learning experiences. Mathematics curriculum, when viewed as an outline of teaching and learning requirements for content and performance, is put in place to structure students' learning experiences in school education (Schmidt et al. 1997). In order to improve students' learning experiences and outcomes, mathematics curriculum and its changes have often been a main focus in large educational reforms in the history of mathematics education in many education systems. Ironically, curriculum has not been a focus in mathematics education research until recent years. For example, the first *Handbook on Mathematics Teaching and Learning* (Grouws 1992) published by the U.S. National Council of Teachers of Mathematics (NCTM) in 1992 does not have a chapter on mathematics curriculum. However, the curriculum issue has attracted more and more attention with the release of NCTM Standards (1989, 2000) and the U.S. National Science Foundation's efforts in promoting and evaluating new

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curriculum material development over the years. Consequently, the *Second Handbook on Mathematics Teaching and Learning* (Lester 2007) contains one chapter specifically related to curriculum (see Stein et al. 2007).

Given the importance of mathematics curriculum in school education, it is not surprising that mathematics curriculum and its impact on teaching and learning have received increasingly more research attention both in the United States and internationally (e.g., Leung and Li 2010; Li and Kulm 2009; Schmidt et al. 1997; Senk and Thompson 2003). For example, the Third International Mathematics and Science Studies (TIMSS) examined curriculum materials and specified the process of curriculum transformation as a guideline to conceptualize the relationship between curriculum analysis and students' learning (e.g., Schmidt et al. 1997, 2002). While students' performance was viewed as the achieved curriculum, what is provided in curriculum guidelines was treated as the intended curriculum. The results obtained from TIMSS curriculum studies and relevant others illustrated the unique value of examining mathematics curriculum in school education in an international context (e.g., Schmidt et al. 2002).

Education systems differ in many ways, including the social-cultural context and specific motivations behind curriculum reforms. However, across education systems, curriculum changes are inevitably connected to a range of common factors throughout the process of school education; including policy, curriculum development, school context, teachers' knowledge, classroom instruction, and student learning. The inclusion and connection of multiple contributing factors arising in the process of school education make the improvement of mathematics education through curriculum changes an extremely complex process. Thus a basis of sound research is thus very important for designing and guiding needed curriculum changes. Learning and sharing of mathematics curriculum and its changes in different education systems should provide us with a unique lens to advance curriculum research and practice from an international perspective.

Recent curriculum studies have indeed expanded to explore a range of important topics, including policy issues in school mathematics (e.g., Reys 2006; Usiskin and Willmore 2008), curriculum development and analysis (e.g., Hirsch 2007; Usiskin and Willmore 2008; Valverde et al. 2002), teachers' use of curriculum materials (e.g., Gueudet et al. 2012; Remillard et al. 2009), and curricular impact on students' learning (e.g., Senk and Thompson 2003). Given the increasing number of curriculum studies, it becomes important to survey, synthesize, and extend current research development on mathematics curriculum. The development of this book project reflects this growing research interest in mathematics curriculum on these important topics. This led to the book's structure of an introduction followed by four parts (i.e., Parts II to V) with different, yet connected, focuses on policy, curriculum development and analysis, teachers and teaching, and student learning. Moreover, this book is also designed to connect with recent international studies that have documented curriculum practices in different education systems across the world. In particular, this book was initiated and motivated by the following two further reasons.

First, this book presents an extension of a thematic issue of ZDM on mathematics curriculum ("Curriculum Research to Improve Mathematics Teaching and

Learning: Practices and Approaches in China and the United States" edited by Li and Kulm 2009). As the thematic issue of ZDM focuses on curriculum practices and approaches, relevant studies illustrate curriculum practices in China (e.g., teachers' lesson planning, textbook development) that are interestingly different from many of others in other systems such as in the United States. With limited knowledge available about many aspects of mathematics curriculum across education systems, this book contains a collection of studies on mathematics curriculum from more than ten education systems across the world.

Second, this book also builds upon another previous work on mathematics curriculum and teacher education in East Asia (Leung and Li 2010). In particular, in that work, changes and issues in mathematics curriculum in six selected education systems in East Asia (Chinese Mainland, Hong Kong, Japan, Singapore, South Korea, and Taiwan) were included and discussed. Surprisingly, although these six education systems in the same region share many similarities (e.g., system structures and students' high achievement in mathematics), their mathematics curricula differ in many ways including curriculum development trajectories and what is valued for students to learn. The differences reinforce the notion that curriculum is a system and cultural artifact that cannot be detached from its system and cultural context (Li and Leung 2010). This book thus contains a collection of chapters in Parts II to V with a focus on curriculum research and practice in individual education systems.

Developing and editing this thematic book also builds upon our ongoing work and interests in mathematics curriculum development and research (e.g., the widely distributed middle school standards-based *Connected Mathematics Project* curriculum developed by Lappan et al. 2014a, 2014b; Hirsch et al. 2012; Leung and Li 2010; Li and Kulm 2009). At the same time, we would very much like to let readers know that editing this international volume is our second collaboration as co-editors. Our first collaboration was in 2002, a special issue of the *International Journal of Educational Research* (Li and Lappan 2002). Through editing international volumes, we appreciate the great opportunities of learning from our contributors across the world then and now. We are convinced that taking an international perspective, as this book does, provides a unique lens for international readers to reflect, discuss, and advance curriculum research and practice in different education systems.

What Can Readers Expect to Learn from Reading the Book?

Examining and Understanding Mathematics Curriculum in School Education as Presented in Individual Chapters

This book is structured in six parts. The simplest way of reading the book is to follow the book's structure as outlined with several major topics related to curriculum research and practice. Readers can expect to learn about recent curriculum research, perspectives, and practices on topics ranging from policy to student learning in many different education systems.

The first part provides an introduction and related research perspectives, and is made up of four chapters. This introduction chapter is the first, and includes background and purposes. The second chapter by Hugh Burkhardt provides an overview and discussion about possible issues along the process of designing, developing, and implementing curriculum. Hugh argues that some deep-seated problems at school system level should be addressed for making intended curriculum changes a reality. In the third chapter, Barbara Reys highlights current curriculum changes as happened in a specific educational system (the United States), which are reflected mainly in how curriculum standards are established and students' learning outcomes are assessed. Chapter 4 by Alan Schoenfeld provides an overview and reflection on worldwide curriculum changes across educational systems. The diverse changes in curriculum, as a system and cultural artifact, across selected education systems led Alan to conclude that there is no single worldwide trend in curricula.

For each of Parts II to V, the inclusion of prefaces should provide readers with an overview of and some insights into these parts. In general, the second part contains a collection of five chapters that examine policy issues related to mathematics curriculum that are in operation in different education systems. Specific topics include the process of curriculum decision-making, curriculum changes as imposed by system-wide curriculum standards, curriculum policy, and education changes viewed from a historical perspective. The three follow-up parts contain a similar number of chapters from different education systems but with focuses on "curriculum development and analysis" (Part III with six chapters), "curriculum, teacher, and teaching" (Part IV with six chapters), and "curriculum and student learning" (Part V with five chapters), respectively.

Part VI is the last section for cross-national comparison and commentary. Chapter 27 by Zalman Usiskin provides a summary of the results from several large-scale international studies over the past 48 years, with a focus on U.S. students' mathematics performance. He argues that international comparisons of students' performance cannot be a fair assessment of the achieved curricula of different countries, with many other contributing factors and restrictions in place. Finally, there are two commentary chapters contributed by scholars: one from the East and one from the West. These two chapters help to draw together the research reported in Parts II to V, and to reflect on what we can learn from this international collaborative publication effort and on possible research directions for the future.

Cross-Examining and Reflecting on Mathematics Curriculum in School Education from an International Perspective

Readers can learn more beyond what is provided in individual chapters through reading and reflecting across chapters in the book. As a collection, this book provides diverse perspectives and approaches that are developed and used in more than ten education systems. It is important for readers to take further steps to cross-examine and reflect on issues that are pertinent to their interest. Here we would like

to highlight the following four aspects that are important to the broad international readership interested in mathematics education and curriculum studies.

(1) *Identifying and understanding what is important in mathematics for teaching and learning in different education systems*

We know that school mathematics as a subject and school mathematics as a curriculum are two closely related but different concepts. On the one hand, school mathematics as a subject is what every student is expected to learn. It refers to the same body of mathematics knowledge and logic across different system and cultural contexts. For example, "$3 + 2 = 5$; $2 \times 5 = 5 \times 2$" are true no matter whether they are taught in Africa, Asia, or the US with the use of different languages or manipulatives. On the other hand, school mathematics as a curriculum is specified and organized differently across education systems (or even within a single education system such as the U.S.; see Reys 2014). There is no single curriculum that works equally well for every student or every system, and the reason is quite straight forward: curriculum is a system and cultural artifact that reflects values, history, students' learning, and cultural contexts embedded in different system contexts (e.g., Kulm and Li 2009; Schoenfeld 2014). The dual nature of school mathematics suggests to us to go beyond possible surface differences in school mathematics to examine and understand what is important in mathematics for teaching and learning, an important topic of research for mathematics educators to cross-examine and understand mathematics curricular contributions to students' learning.

Over the past two decades, students' mathematics performance has been assessed through several large-scale international studies. One popular approach is to identify and specify certain content topics and performance expectations in curriculum that are important across many education systems (e.g., TIMSS). However, what students have learned as reflected in the assessment results can be different from what is expected in the intended curriculum. The issue of identifying and specifying what is important in school mathematics can and should be examined and addressed at different levels: the intended, textbook, implemented, assessed, and achieved curriculum (e.g., Schmidt et al. 1997; Travers and Westbury 1989). Across these levels along the process of curriculum development and implementation, there are often mismatches (Burkhardt 2014). Thus, readers should be aware of the specific curriculum level when trying to identify and understand what is important in mathematics for teaching and learning. For example, chapters in Parts II and III provide examples of what mathematics is identified as important for teaching and learning in the intended curriculum or textbooks. Possible content specifications can be on what mathematics topics are required in school education, when certain content topics are placed at specific grade levels, or how certain mathematics content topics are specified for teaching and learning. Readers can find various specifications both within and across education systems. As an illustration, Zanten and Van den Heuvel-Panhuizen (2014) examined textbooks' presentations of the content topic of subtraction up to 100 that is required very broadly in the Dutch intended curriculum. Their analyses of two Dutch textbook series revealed dramatic differences in their content treatment and the performance expectations of this same content topic. The

content specification differences among the Dutch intended curriculum and these two Dutch textbooks suggest not only the complexity of curriculum issues, but also the importance of specifying the curriculum level when identifying and examining mathematics that is required and important for teaching and learning.

Moreover, Dylan Wiliam (2014) reminds us that both our understanding of the nature of mathematics and what mathematics is important for teaching and learning evolve over time, especially with the increased use of technology in mathematics and mathematics education. It is unrealistic to find or define a universal curriculum that works all the time across education systems. Yet it is realistic and desirable to identify or develop world-class mathematics curricula that can help students to achieve their greatest potential.

(2) *Understanding mathematics curriculum and its changes that are valued over time in different education systems*

Readers may quickly notice that mathematics curriculum varies from system to system and over time. Thus, it is not surprising if a worldwide trend in mathematics curriculum is not readily identifiable (Schoenfeld 2014). In fact, such diversity is also evident for several high-achieving education systems in the same region (e.g., Li and Leung 2010; Wong et al. 2014). For example, Japan, Korea and Singapore share some similarities in certain aspects of mathematics curriculum policies, but differ in others (Wong et al. 2014). Also, policy-making in these systems is often influenced by different factors over time, relating to specific values, politics, and history in different education systems.

However, curricular differences across system and cultural contexts do not rule out the great value of learning from each other, but place a strong cautious note for what can be learned from a specific education system. With this understanding in mind, readers should be able to learn more when reading across chapters.

(3) *Identifying and analyzing curriculum practices that are effective*

Efforts to improve students' mathematics performance have led to ever-increased interest in identifying and learning possible best practices, including curriculum. It is undeniable that curriculum plays a key role in guiding and structuring students' learning of mathematics. Questions are often asked about curriculum such as, what mathematics is important for students to learn (as discussed above as the first point), how mathematics content topics can be placed and sequenced for teaching and learning at different grade levels, and how school mathematics can be organized and structured in ways to best facilitate teaching and learning. The diverse approaches practiced in different education systems provide unique opportunities for readers to learn and examine different practices that are effective in specific system contexts. For example, Lee (2014) discusses curriculum development practices in Singapore that have evolved from a deductive approach to a mixed model approach that contains elements of both the deductive and inductive approaches. He illustrates how school-based curriculum innovations contribute to the deductive approach typically used in a centralized education system. Similar changes have also taken place in China, where local education administrations are given more responsibilities in

curriculum development and implementation with more textbook choices (Li et al. 2014; Liu and Li 2010).

In contrast to curriculum practices in centralized education systems such as China and Singapore, several decentralized education systems have moved in the opposite direction. For example, common curriculum standards are now developed and implemented in Australia and most states of the US (Anderson 2014; Reys 2014; Stephens 2014; Wu 2014). These seemingly opposite moves in curriculum practices actually suggest a middle-ground approach that is now welcomed and used in both centralized and decentralized education systems.

Readers are also encouraged to go into the details about specific curriculum practices, such as approaches used in textbook development and content presentation (e.g., Cai et al. 2014; Even and Olsher 2014; Li et al. 2014), and teachers' implementation of curriculum (e.g., Huang et al. 2014; Stein et al. 2014; Takahashi 2014). Learning about specific curriculum practices that are effective in certain context should encourage us to think more about what is possible in our own context.

(4) *Identifying and examining effective infrastructure for curriculum development and implementation*

Mathematics curriculum does not simply stay at the policy level as intended, but goes throughout the whole process of school education including textbooks, the implemented, assessed, and achieved curriculum. Curriculum is an essential element that helps make school education into a structured experience for students. Thus, the connections and alignments of different levels of curriculum along the process of school education are very important, but its research is long overdue. As Fey (2014) points out, reforming the intended curriculum is often taken as the simplest and most common strategy for seeking improvement in school education. Yet, such efforts often fail to lead to expected changes. Systematic research is missing to develop and examine effective infrastructure for the entire process of curriculum development and implementation.

Readers can quickly realize that such systematic research would be a massive undertaking. In fact, it is not clear to us whether such research can be productive, given that curriculum is just one contributing factor to the improvement of students' learning. However, we encourage readers to pay close attention to different curriculum practices that are presented in different parts of the book. Although no direct connections are readily available for different curriculum practices discussed in various chapters, it is the overarching idea that should guide readers to explore and identify different practices that might be pieced together for effective curriculum development and implementation. It should be pointed out that this is another reason for how we have structured the book with four distinctive yet closely related curriculum parts.

Significance and Limitations

In summary, this book is positioned to make unique contributions to a growing body of mathematics curriculum studies and provides a platform for mathematics educa-

tors all over the world to share and discuss different curriculum practices, both those that were effective and those that were less successful. We would like to emphasize the following points. First, chapters in this book present and discuss system-based curriculum approaches and practices. This helps readers not only to learn and understand curriculum approaches and practices in a specific system and cultural context, but also to reflect on possible advantages and restrictions of different curriculum approaches and practices. Second, the book is organized into chapters with a structure of parts that is consistent with the process of curriculum development and implementation. It is important for readers to read not just individual chapters or parts but also across different chapters and parts. Identifying possible connections among diverse curriculum practices can thus be made possible for considering systematic improvement. Third, this book is not restricted to the mathematics curriculum itself, but includes topics related to mathematics teaching and learning. Such a comprehensive picture allows readers to see the complexity of curriculum issues, and also various possibilities for helping make curriculum changes a success.

Meanwhile, we are also aware of the limitations of this book. The inclusion of different education systems does not imply any specific representations, but rather illustrates diversity. Specific curriculum approaches and practices, as presented and discussed in different chapters, are important sources of knowledge but are not prespecified. Thus, it is unclear whether specific approaches and practices are representative in selected education systems. Nevertheless, this book takes an important step to promote the sharing and exchange of different curriculum research and practices across education systems. Advancing curriculum research and practice from an international perspective provides us with a unique opportunity that is otherwise not available within an education system.

References

Anderson, J. (2014). Forging new opportunities for problem solving in Australian mathematics classrooms through the first national mathematics curriculum. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Burkhardt, H. (2014). Curriculum design and systemic change. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Cai, J., Nie, B., Moyer, J., & Wang, N. (2014). Teaching mathematics using standards-based and traditional curricula: a case of variable ideas. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Even, R., & Olsher, S. (2014). Teachers as participants in textbook development: the integrated mathematics wiki-book project. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Fey, J. (2014). Preface to part IV. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Grouws, D. (Ed.) (1992). *Handbook of research on mathematics teaching and learning*. New York: Macmillan.

Gueudet, G., Pepin, B., & Trouche, L. (Eds.) (2012). *From text to 'lived resources—mathematics curriculum materials and teacher development*. New York: Springer.

Hirsch, C. R. (Ed.) (2007). *Perspectives on the design and development of school mathematics curricula*. Reston: National Council of Teachers of Mathematics.

Hirsch, C. R., Lappan, G., & Reys, B. (2012). *Curriculum issues in an era of Common Core State Standards for Mathematics*. Reston: National Council of Teachers of Mathematics.

Huang, R., Ozel, Z. E. Y., Li, Y., & Osborne, R. V. (2014). Does classroom instruction stick to textbooks?—a case study of fraction division. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Kulm, G., & Li, Y. (2009). Curriculum research to improve teaching and learning: national and cross-national studies. *ZDM—The International Journal on Mathematics Education*, *41*, 709–715.

Lappan, G., Phillips, E. D., Fey, J., & Friel, S. N. (2014a). *Connected mathematics—covering and surrounding*. Boston: Pearson Education.

Lappan, G., Phillips, E. D., Fey, J., & Friel, S. N. (2014b). *Connected mathematics—thinking with mathematical models*. Boston: Pearson Education.

Lee, N. H. (2014). The Singapore mathematics curriculum development—a mixed model approach. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Lester, F. K. Jr. (Ed.) (2007). *Second handbook of research on mathematics teaching and learning*. Charlotte: Information Age.

Leung, F. K. S. & Li, Y. (Eds.) (2010). *Reforms and issues in school mathematics in East Asia—sharing and understanding mathematics education policies and practices*. Rotterdam: Sense.

Li, Y. & Kulm, G. (Eds.) (2009). Curriculum research to improve mathematics teaching and learning. *ZDM—The International Journal on Mathematics Education*, *41*, 709–832.

Li, Y. & Lappan, G. (Eds.) (2002). Developing and improving mathematics teachers' competence: practices and approaches across educational systems. *A special issue of the International Journal of Educational Research*, *37*(2), 107–232.

Li, Y., & Leung, F. K. S. (2010). Practices and changes in mathematics curriculum and teacher education in selected education systems in East Asia: what can we learn? In F. K. S. Leung & Y. Li (Eds.), *Reforms and issues in school mathematics in East Asia—sharing and understanding mathematics education policies and practices* (pp. 233–244). Rotterdam: Sense.

Li, Y., Zhang, J., & Ma, T. (2014). School mathematics textbook design and development practices in China. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Liu, J., & Li, Y. (2010). Mathematics curriculum reform in the Chinese mainland: changes and challenges. In F. K. S. Leung & Y. Li (Eds.), *Reforms and issues in school mathematics in East Asia* (pp. 9–31). Rotterdam: Sense.

National Council of Teacher of Mathematics (1989). *Curriculum and evaluation standards for school mathematics*. Reston: Author.

National Council of Teacher of Mathematics (2000). *Principles and standards for school mathematics*. Reston: Author.

Remillard, J. T., Herbel-Eisenmann, B. A., & Lloyd, G. M. (Eds.) (2009). *Mathematics teachers at work: connecting curriculum materials and classroom instruction*. New York: Routledge.

Reys, B. J. (Ed.) (2006). *The intended mathematics curriculum as represented in state-level curriculum standards: consensus or confusion?* Charlotte: Information Age.

Reys, B. J. (2014). Mathematics curriculum policies and practices in the U.S.: the common core state standards initiative. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Schmidt, W. H., McKnight, C. E., Valverde, G. A., Houang, R. T., & Wiley, D. E. (1997). *Many visions, many aims (Vol. 1): a cross-national investigation of curricular intentions in school mathematics*. Dordrecht: Kluwer Academic Press.

Schmidt, W. H., McKnight, C. E., Houang, R. T., Wang, H., Wiley, D. E., Cogan, L. S., et al. (2002). *Why schools matter: a cross-national comparison of curriculum and learning*. San Fransisco: Jossey-Bass.

Schoenfeld, A. (2014). Reflections on curricular change. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Senk, S. L., & Thompson, D. R. (2003). *Standards-based school mathematics curricula: what are they? What do students learn?* Mahwah: Lawrence Erlbaum Associates.

Stein, M. K., Remillard, J., & Smith, M. S. (2007). How curriculum influences student learning. In F. K. Lester Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 319–369). Charlotte: Information Age.

Stein, M. K., Kaufman, J., & Kisa, M. T. (2014). Mathematics teacher development in the context of district managed curriculum. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Stephens, M. (2014). The Australian curriculum: mathematics—how did it come about? What challenges does it present for teachers and for the teaching of mathematics? In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Takahashi, A. (2014). Supporting the effective implementation of a new mathematics curriculum: a case study of school-based lesson study at a Japanese public elementary school. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Travers, K. J., & Westbury, I. (1989). *The IEA study of mathematics I: analysis of mathematics curricula*. Supplement, available from ERIC as ED306111.

Usiskin, Z., & Willmore, E. (Eds.) (2008). *Mathematics curriculum in Pacific Rim countries: China, Japan, Korea, and Singapore*. Charlotte: Information Age.

Valverde, G. A., Bianchi, L. J., Wolfe, R. G., Schmidt, W. H., & Houang, R. T. (2002). *According to the book: using TIMSS to investigate the translation of policy into practice through the world of textbooks*. Dordrecht: Kluwer.

Wiliam, D. (2014). What mathematics do children learn at school? (preface to part V). In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Wong, K. Y., Koyama, M., & Lee, K.-H. (2014). Mathematics curriculum policies: a framework with case studies from Japan, Korea, and Singapore. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Wu, H.-H. (2014). Potential impact of the common core mathematics standards on the American curriculum. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.

Zanten, M., & Van den Heuvel-Panhuizen, M. (2014). Freedom of design: the multiple faces of subtraction in Dutch primary school textbooks. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education*. Dordrecht: Springer.